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1900

ANALYSES OF

PIG IRON

COLLECTED AND PUBLISHED BY

SEYMOUR R. CHURCH

SAN FRANCISCO

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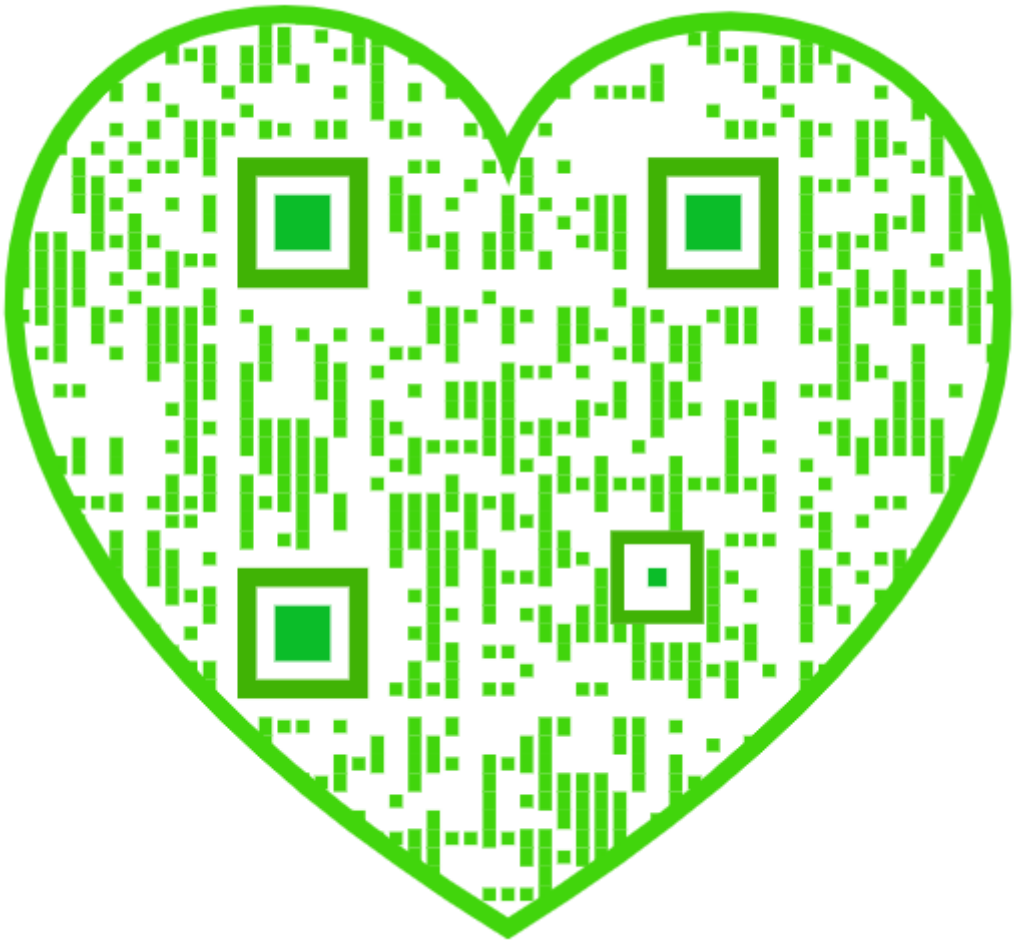

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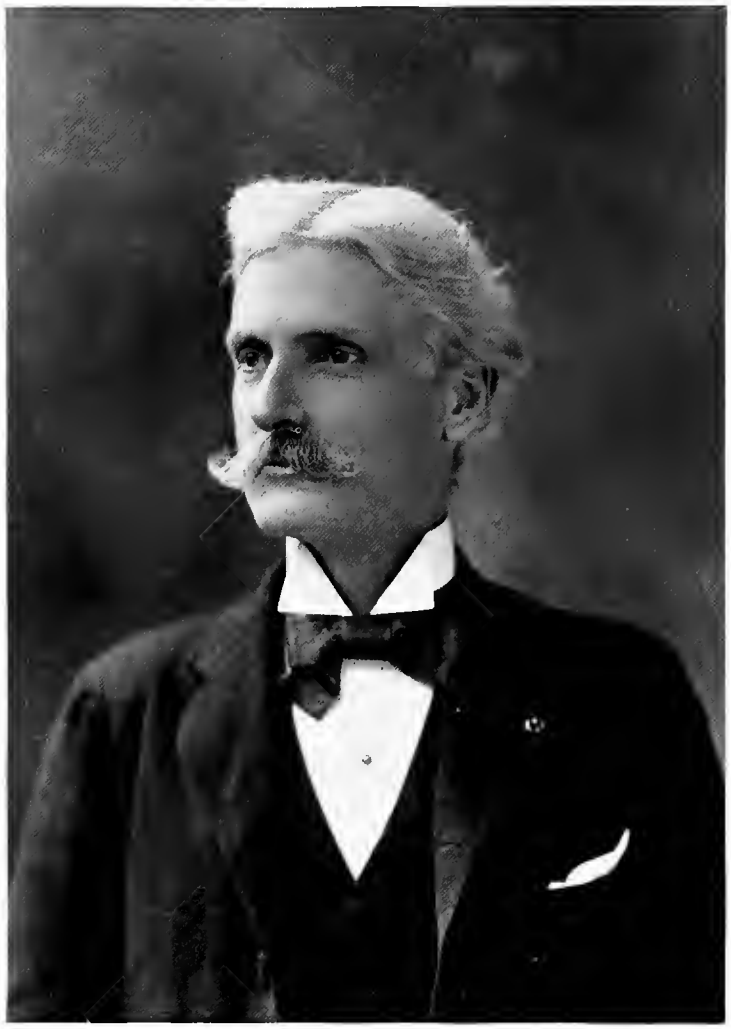

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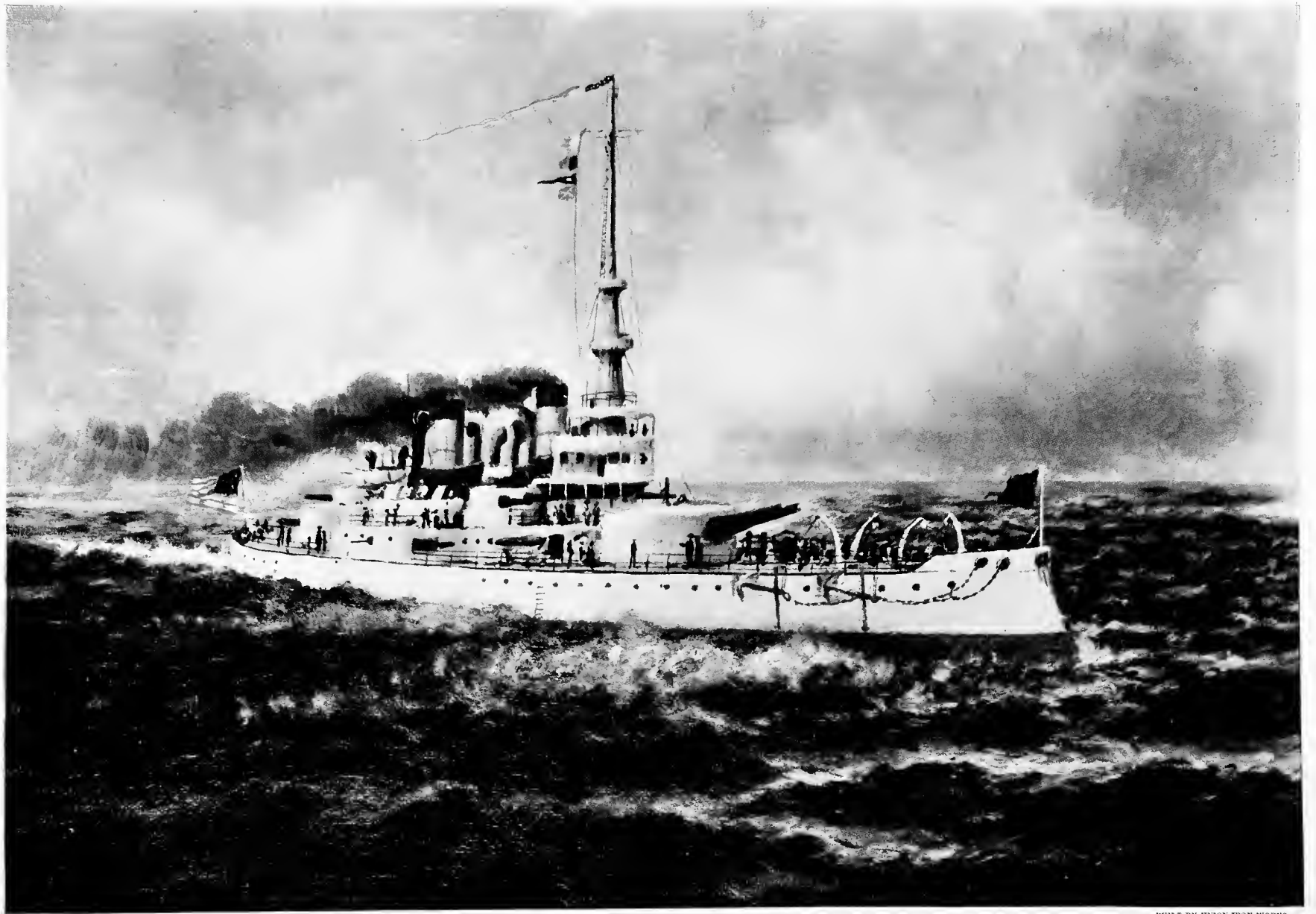

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ANALYSES

OF

PIG IRON

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SAN FRANCISCO

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U. S. A.

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PREFACE.

Herewith is presented Volume One of "Analyses of Pig Iron," which is the first publication of this character ever issued.

The increasing demand from foundrymen and others for analyses of different kinds of pig iron, led the publisher to believe that a work of this kind would deserve the support of makers and melters of iron.

This work comprises analyses of pig iron made in the United States, Great Britain and other countries, and also important statistics relative to the production.

The analyses in nearly every instance were received either from the furnaces direct or from furnace agents, and although the publisher realizes that some of them do not seem correct, yet they have been copied just as they were received, and are on file open to inspection. The collecting of these analyses has necessarily opened up a voluminous correspondence, several thousand letters having been written to obtain the information contained in this volume, and if every furnace had given the desired information, a great many more analyses could have been published, but some of them declined to give same; however, the publisher hopes that when the different makers of pig iron see this work they will at once realize its importance and furnish the desired information for the next volume, which will be published in the early part of the year 1901. It will contain entirely new matter, and will not be a repetition of the matter contained herein.

The half-tone cuts, representing the fracture of different brands and grades of pig iron, will be interesting, as they show the various characteristics of the iron, and the accompanying illustrations of furnaces will give the reader a very good idea of the plants where the iron is manufactured.

In conclusion, the publisher wishes to say that while he is grateful to all those who have in any way contributed information for this volume, he is especially indebted to Messrs. Girvin & Eyre, of San Francisco, who, through their London correspondents, have furnished much valuable information relative to the pig iron made in Great Britain.

THE PUBLISHER.

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ANALYSIS OF IRON IN MIXTURE.

BY WM. CHRISTIE HERRON.

The ambition of every foundryman is to secure castings as nearly perfect as possible, and to accomplish this the element of silicon must be watched particularly.

In foundry practice where pig alone is used the No. 2 Foundry Grade is the most popular in making ordinary castings because it contains usually the most accommodating percentage of silicon, about 2.50.

It is the belief of many that better results are obtained using No. 2 Soft with No. 3 Foundry, and different brands, if in affinity. Here the silicon in the No. 2 Soft will approximate 3% and in the No. 3 Foundry, 2%, giving the No. 2 Foundry Grade average of 2½% silicon.

It is quite superfluous to say that the percentage of silicon to be used depends upon the character of castings desired.

Silicon acts upon the carbon causing a change from the combined to the graphitic state. Low silicon results in more combined carbon, less graphite and castings more or less hard. Higher silicon produces more graphite, less of the combined carbon and softer castings.

It is in this change produced by silicon that the carbon becomes more graphitic and that small expansion into a trifle more bulk is wherein the shrinkage is overcome.

Too much silicon is as injurious as too little.

GRAPHITE—

Retards fluidity.

Opens the grain.

Renders heavy castings porous when in excess.

Total Carbon should not be less than 3.25%

MANGANESE—

Closes grain, increases shrinkage and adds strength.

Also reduces tendency to blowholes.

Should not exceed .5%

SULPHUR—

Promotes blowholes, weakens the metal, increases shrinkage.

Should not exceed .05%

PHOSPHORUS—

Promotes fluidity, reduces shrinkage, reduces strength.

(Except that in reducing shrinkage it relieves the casting from strain.)

Should exist from .5% to .8%

SILICON—

Promotes fluidity, decreases shrinkage, reduces strength.

Should exist in heavy castings from 1½% to 2%;

in medium 2% to 3%; in very light 4% to 6%.

When you want strength never get the Silicon and Phosphorus high at the same time.

PIG IRON;

IMPURITIES, GRADING, ETC.

Written by W. T. SHEPARD, Secretary Tonawanda Iron and Steel Co., North Tonawanda, N. Y., U. S. A.
Especially for this Publication.

The ordinary impurities which are found in Pig Iron are silicon, sulphur, phosphorus, manganese, combined and graphitic or free carbon. There are rarely any other elements entering into pig iron in sufficiently large amounts to warrant consideration. The aggregate of impurities in ordinary foundry iron rarely reaches 10%, the remainder of course is metallic iron.

Each impurity mentioned above has its own individual way of influencing the character of resultant castings, and also of changing the nature of the pig iron. On this account the physical appearance of pig iron varies. To the layman pig iron is pig iron, but the consumer must know the character of the iron he is using. The most common way in the past has been for a consumer to continue using the brand and grade with which he has been familiar, and to depart from it only with fear and trembling, after the trial of a sample lot of other iron.

Every blast furnace has a name, and up to date most makers of foundry iron cling to the old-fashioned rule of thumb method of grading, which is by physical appearance of fracture. There is no question but that this method is better than no grading at all, but it is very misleading and inaccurate. It is a rough approximation at the only true way, namely, by chemical analysis.

One general scheme of grading obtains all over the United States, but a slight difference exists between Northern and Southern furnaces. The grades of the former generally are about as follows: No. 1x, No. 2x, No. 2 Plain, No. 3, Grey Forge, Mottled and White; of the latter No. 1 Fdy., No. 2 Fdy., No. 3 Fdy., No. 1 Soft, No. 2 Soft, Silvery, No. 4 or Grey Forge, Mottled and White.

The only difference between the Northern and Southern systems of grading is that No. 1x is more open grained than No. 1 Fdy., and that the No. 2x and 2 Plain grades united make the Southern No. 2 Fdy.

While No. 1 Soft, No. 2 Soft, and Silvery grades of foundry iron are quite common at Southern furnaces on account of the stock used and method of operating the furnaces, they are so uncommon in the North that should any be made they are usually absorbed in 1x, 2x or 2 Plain as the case may be.

In order to grade by fracture the iron is broken; the most open grained iron and that which carries a uniform open grain to the outside of the pig, is called No. 1x; the slightly closer grained and that which has a still closer grained band running around the outside of the pig, is called No. 2x; 2 Plain has either a uniform closer fracture than the 2x or else it has a fracture like the 2x at the top of the pig (i. e. toward the flat side) and

is considerably closer at the bottom. No. 3 is uniformly closer than No. 2 Plain. Grey Forge has a hard appearance, is usually honeycombed on the face or top of the pig, and frequently has a slight band or wire chill around the edge. Its grain is slightly closer than No. 3.

Mottled iron is so called because that describes it. It is of mottled appearance and is really No. 5 grade. White iron, or No. 6 is white and rings when struck with a hammer.

The difference in these grades, all made by the same furnace from the same stock, is due to the chemical constituents. If the consumer knew what he needed and what he didn't want chemically he would have no use for the grading described above. In other words, the laboratory should do the grading.

It is easy to see how the system of grading by fracture was founded. Instead of being assorted on account of the beneficial or injurious impurities which it contained and which could be found out only by means of chemists and laboratory, it was sorted by the appearance of the iron, which features were caused by its chemical constituents. It goes without saying that if one knows the agent that causes a condition it is unnecessary to inquire into the condition, particularly when the latter is quite obscure. For instance, an expert furnaceman can tell by a glance at his iron whether or not it is high in sulphur. He knows its character so well that if it comes out by fracture light colored, hard and brittle and of a Grey Forge, Mottled or White grade, he immediately concludes that it is high in sulphur. No one but the chemist can tell how much sulphur is in the iron. It is dangerous for a foundryman to use too high sulphur iron, and so Grey Forge always used to be sent to rolling mills alone. If by means of analysis (the fracture being Grey Forge) it is found that the sulphur is not too high, the iron is suitable and desirable for use in the grey iron foundry. High sulphur is the curse of foundrymen, but excess sulphur in castings is attributable 99 times out of 100 to the fuel used in the fouudry. Too much sulphur causes weak, light colored, brittle and very shrinky castings. The amount of sulphur that can be safely carried in castings of different character must be determined in each case by physical and chemical tests in conjunction. For general castings it is wise to have sulphur kept below .07%. Some authorities maintain that such castings as cylinders are not injuriously affected if the sulphur is .08 or .09%.

Graphitic Carbon is a softener but if in excess amount will cause dirty castings on account of the iron being too rich. This can be corrected by using No. 4 pig or scrap in the mixture.

Silicon is a softener and fluidizer when used moderately, but if in excess it has a tendency to harden. The exact amount for different work is determined by experience.

Phosphorus is a fluidizer and if in excess weakens the iron materially.

Manganese has a tendency to close the grain of iron, and yet it really operates as a softener. This is undoubtedly due to its affinity for sulphur if at a high heat, so that it really acts as a flux.

PRODUCTION OF PIG IRON IN THE UNITED STATES

FURNISHED BY ROGERS, BROWN & CO.

1810	53,908	1860	821,223
1820	20,000	1870	1,665,178
1830	165,000	1880	3,835,191
1840	286,903	1890	9,202,703
1850	563,755	1899	13,620,703

Production of Pig Iron in the United States, from 1896 to 1899, by States.

Gross tons of 2240 pounds.

States.	1896.	1897.	1898.	1899.
Massachusetts	1,873	3,284	3,661	2,476
Connecticut	10,187	8,336	6,336	10,129
New York	206,075	243,304	228,011	264,346
New Jersey	59,163	95,696	100,681	127,598
Pennsylvania	4,024,166	4,631,634	5,537,832	6,558,878
Maryland	79,472	193,702	190,974	234,477
Virginia	386,277	307,610	283,274	365,491
North Carolina, Georgia	17,744	17,092	13,762	17,835
Alabama	922,170	947,831	1,033,676	1,083,905
Texas	1,221	6,175	5,178	5,803
West Virginia	108,569	132,907	192,699	187,858
Kentucky	70,660	35,899	100,724	119,019
Tennessee	248,338	272,130	263,439	346,166
Ohio	1,196,326	1,372,889	1,986,358	2,378,212
Illinois	925,239	1,117,239	1,365,898	1,442,012
Michigan	149,511	132,578	147,640	134,443
Wisconsin, Minnesota	158,484	103,909	172,781	203,175
Missouri	12,548	23,883	141,010	138,880
Colorado	45,104	6,582		
Total	8,623,127	9,652,680	11,773,934	13,620,703

AMERICAN PIG IRON STOCKS

Total Furnace and American pig iron warehouse stocks **January 1st** of each year were as follows:

1898	1,042,882
1899	659,621
1900	142,781

IMPORTS OF PIG IRON INTO THE UNITED STATES IN THE YEARS NAMED, INCLUDING SPIEGELEISEN, FERRO-MANGANESE AND FERRO-SILICON.

	Gross Tons.
1871	219,228
1875	74,939
1880	700,864
1885	146,740
1890	134,955
1891	67,179
1892	70,125
1893	54,394
1894	15,582
1895	53,232
1896	56,272
1897	19,212
1898	25,152
1899	40,372

PRODUCTION OF PIG IRON IN THE UNITED STATES, GREAT BRITAIN AND GERMANY FROM 1889 TO 1899 INCLUSIVE.

YEARS	UNITED STATES GROSS TONS	GREAT BRITAIN GROSS TONS	GERMANY METRIC TONS
1889	7,603,642	8,322,824	4,524,558
1890	9,202,703	7,904,214	4,658,450
1891	8,279,870	7,406,064	4,641,217
1892	9,157,000	6,709,255	4,937,461
1893	7,124,502	6,976,990	4,986,003
1894	6,657,388	7,427,342	5,380,038
1895	9,446,308	7,703,459	5,464,501
1896	8,623,127	8,659,681	6,372,575
1897	9,652,680	8,796,465	6,864,405
1898	11,773,934	8,609,719	7,232,988
1899	13,620,703	9,305,319	8,029,305

UNITED STATES OF AMERICA

UNITED STATES OF AMERICA

ALABAMA

ALABAMA CONSOLIDATED COAL AND IRON COMPANY, Birmingham, Jefferson County. Stacks, 2 at Ironaton, Talladega County; 1 at Gadsden, Etowah County, and 1 at Birmingham, Jefferson County. Total capacity, 150,000 tons per year. Fuel, coke. Ores, red and brown hematite. Brands, "Clifton" and "Etowah."

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 1 Soft.	No 2 Soft.	Silvery Grey.
Silicon	2.50 to 2.75	2.25 to 2.50	2.00 to 2.25	1.75 to 2.00	1.00 to 1.75	3.00 to 3.50	3.00 to 4.50	4.00 to 6.00
Phosphorus	.30	.35	.40	.45	.45	.20 to .30	.20 to .30	.17 to .30
Sulphur	.03	.035	.04	.04	.05	.020 to .025	.02 to .03	.015 to .020
Manganese	1.10	1.25	1.30	1.35	1.35	1.00	.75 to 1.25	.75 to 1.00
Combined Carbon	.35 to .50	.35 to .50	.35 to .50	.35 to .50	.35 to .50	.35 to .50	.35 to .50	.35 to .50
Graphitic Carbon	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50	2.25 to 3.50

This company makes all grades of iron ranging in phosphorus from .17 to .50 and sulphur from .01 to .09.

BASS FOUNDRY AND MACHINE COMPANY, Rock Run, Cherokee County. Rock Run Furnace. Stacks, 1. Capacity, 15,000 tons per year. Fuel, charcoal. Ore, local brown hematite. Brand, "Rock Run."

	No 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.500	1.150	.85	.65	.35
Phosphorus	.360	.360	.36	.36	.36
Sulphur	.018	.016	.02	.02	.02
Manganese	.850	.800	.82	.85	.90
Combined Carbon	.350	.450	.60	.90	1.10
Graphitic Carbon	3.150	3.000	2.90	2.70	2.20

EAGLE IRON COMPANY, Attalla, Etowah County. Attalla Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, charcoal. Ores, red and brown hematite. Brand, "Attalla."

This furnace is operated by the Rome Furnace Company, Rome, Ga., and the analysis of this iron is approximately the same as made by that company.

ALABAMA (Continued)

JENIFER FURNACE COMPANY, Jenifer, Talladega County. Jenifer Furnace. Stacks, 1 Capacity, 12,000 tons per year. Fuel, charcoal. Ore, local brown hematite. Brand, "Jenifer."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	3.40	2.60	1.80	2.40
Phosphorus	.80	.90	1.00	1.40
Sulphur	...	.05	....	....
Manganese	1.20	1.90	1.80	2.30

JONES VALLEY IRON COMPANY, Birmingham, Jefferson County. Williamson Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, coke. Ores, red and brown hematite. Brand, "Williamson."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 1 Soft.	No. 2 Soft.
Silicon	2.750	2.500	2.250	3.50	3.25
Phosphorus	.740	.740	.740	....	....
Sulphur	.033	.033	.033	...	..
Manganese	.510	.510	.510	..	..

NORTHERN ALABAMA COAL, IRON AND RAILWAY COMPANY, Talladega, Talladega County. Talladega Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, Alabama and West Virginia coke. Ore, brown hematite. Brand, "Talladega."

	No. 2.	No. 3.	No. 4.	Silvery Grey.
Silicon	3.790	3.000	1.790	5.210
Phosphorus	.358	.370	.368	.590
Sulphur	.047	.053	.058	.019
Manganese	....	....	.348	.200
Combined Carbon	....	.....	.600	.....

PIONEER MINING AND MANUFACTURING COMPANY, Thomas, Jefferson County. Pioneer Furnace. Stacks, 2. Total capacity, 95,000 tons per year. Fuel, Alabama coke. Ores, red and brown hematite. Brand, "Pioneer."

	No. 1 X.	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Grey Forge.	No. 1 Soft.	No 2 Soft.
Silicon	2.200	2.110	2.420	2.300	2.460	2.820	2.680
Phosphorus	.800	.700	.812	.800	.819	.712	.780
Sulphur	.018	.019	.015	.052	.098	.008	.010
Manganese	.580	.510	.500	.770	.550	.540	.500
Combined Carbon	.120	.240	.190	.360	.540	.180	.150
Graphitic Carbon	3.621	3.511	3.146	2.980	2.731	2.240	3.400

ALABAMA (Continued)

SHEFFIELD COAL, IRON AND STEEL COMPANY, Sheffield, Colbert County. Sheffield Furnaces. Stacks, 3. Total capacity, 255,000 tons per year. Fuel, Alabama and Virginia coke. Ores, Alabama and Tennessee brown hematite. Brand, "Sheffield."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	No. 1 Soft.	No. 2 Soft.	Grey Forge.
Silicon	2.750	2.500	1.750	1.400	3.250	3.000	1.000
Phosphorus	1.250	1.250	1.250	1.250	1.250	1.250	1.250
Sulphur	.031	.021	.026	.032	.022	.025	.039
Manganese	.650	.650	.600	.600	.700	.700	.620
Combined Carbon	.270	.300	.320	.340	.200	.180	.400
Graphitic Carbon.	3.000	2.970	2.770	2.750	3.000	3.220	2.620

SHELBY IRON COMPANY, Shelby, Shelby County. Shelby Furnaces. Stacks, 2. Total capacity, 40,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Shelby."

Could not obtain analysis of this iron.

SLOSS–SHEFFIELD STEEL AND IRON COMPANY, Birmingham, Jefferson County. Sloss Furnaces. Stacks, 4. Total capacity, 225,000 tons per year. Fuel, coke. Ores, red fossiliferous, hard and soft, and brown hematite. Brand, "Sloss."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Grey Forge.
Silicon	3.600	3.300	3.100	2.300
Phosphorus	.650	.650	.640	.640
Sulphur	.045	.033	.035	.080
Manganese	.482	.349	.430	.680

SLOSS–SHEFFIELD STEEL AND IRON COMPANY, Sheffield, Colbert County. Hattie Ensley Furnace. Stacks, 1. Capacity, 48,000 tons per year. Fuel, coke. Ore, local brown hematite. Brand, "Lady Ensley."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Grey Forge.
Silicon	3.122	3.050	3.010	2.280
Phosphorus	.583	.745	.716	.760
Sulphur	.009	.024	.024	.045
Manganese	.634	.720	.576	.691
Combined Carbon	.060	.070	.110	.240
Graphitic Carbon.	3.370	3.280	3.210	3.070

SLOSS-SHEFFIELD STEEL AND IRON COMPANY, Florence, Lauderdale County. Philadelphia Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Philadelphia."

Could not obtain analysis of this iron.

ALABAMA (Continued)

SPATHITE IRON COMPANY, Birmingham, Jefferson County. Spathite Furnace, No. 1. Stacks, 1. Capacity, 40,000 tons per year. Fuel, Alabama coke. Ores, spathite and brown. Brand, "Spathite."

	No. 1.
Silicon	3.498
Phosphorus	.795
Sulphur	.033
Manganese	1.344
Combined Carbon	.182
Graphitic Carbon	3.220

TENNESSEE COAL, IRON AND RAILROAD COMPANY, Birmingham, Jefferson County. Alice Furnaces. Stacks, 2. Capacity, 113,000 tons per year. Fuel, Pratt coke. Ores, red and brown. Brand, "Alice."

	Basic.
Silicon, under	1.00
Phosphorus, under	1.00
Sulphur, under	.05

TENNESSEE COAL, IRON AND RAILROAD COMPANY, Bessemer, Jefferson County. Stacks, 5. Total capacity, 292,000 tons per year. Fuel, Pratt and Blue Creek coke. Ores, red and brown. Brand, "De Bardeleben."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	Grey Forge.
Silicon	2.530	2.470	2.500	2.260	1.390
Phosphorus	.780	.840	.820	.840	.820
Sulphur	.051	.030	.055	.049	.082
Manganese	.290	410	.490	.480	.350
Combined Carbon	.570	.550	.690	.680	.860
Graphitic Carbon	2.640	2.730	2.690	2.700	2.320

TENNESSEE COAL, IRON AND RAILROAD COMPANY, Ensley, Jefferson County. Ensley Furnaces. Stacks, 4. Total capacity, 292,000 tons per year. Fuel, Pratt coke. Ores, red and brown. Brand, "Ensley."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	Grey Forge.
Silicon	2.250	2.140	1.880	1.730	1.680
Phosphorus	720	.730	.720	.680	.700
Sulphur	.035	.037	.043	.047	.065
Manganese	.510	.700	.460	.590	.620
Combined Carbon	470	.450	.490	.850	.910
Graphitic Carbon	3.080	3.050	3.040	2.450	2.480

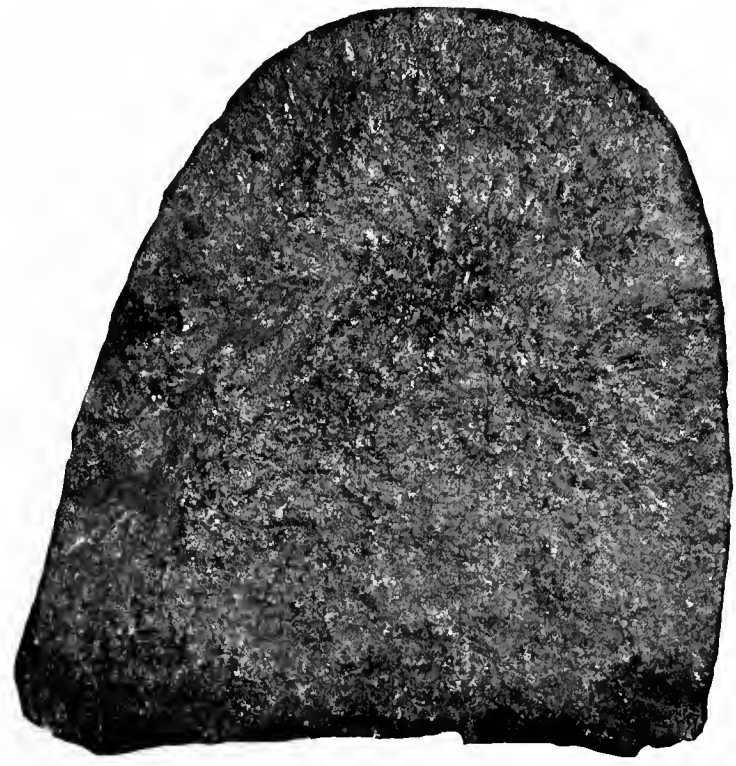
ALABAMA (Continued)

TENNESSEE COAL, IRON AND RAILROAD COMPANY, Oxmoor, Jefferson County. Oxmoor Furnaces. Stacks, 2. Total capacity, 126,000 tons per year. Fuel, Pratt and Blue Creek coke. Ores, red and brown. Brand, "Eureka."

	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	No. 1 Soft.	No. 2 Soft.
Silicon	1.920	2.010	1.940	3.150	3.500
Phosphorus	.880	.890	.880	.860	.850
Sulphur	.035	.039	.060	.025	.016
Manganese	.450	.470	.490	.290	.340
Combined Carbon	.530	.650	.890	.200	.190
Graphitic Carbon	2.740	2.560	2.360	2.940	2.890

TRUSSVILLE FURNACE MINING AND MANUFACTURING COMPANY, Trussville, Jefferson County. Trussville Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, Alabama coke. Ores, red and brown hematite. Brand, "Trussville."

	No. 1.	No. 2.	No. 3.	Grey Forge.
Silicon	3.925	2.878	2.610	1.750
Phosphorus	.486	.556	.520	.445
Sulphur	.035	.042	.061	.059
Manganese	.417	.479	.408	....
Combined Carbon	.052	.067	.080	1.012
Graphitic Carbon	3.425	3.160	2.895	2.671

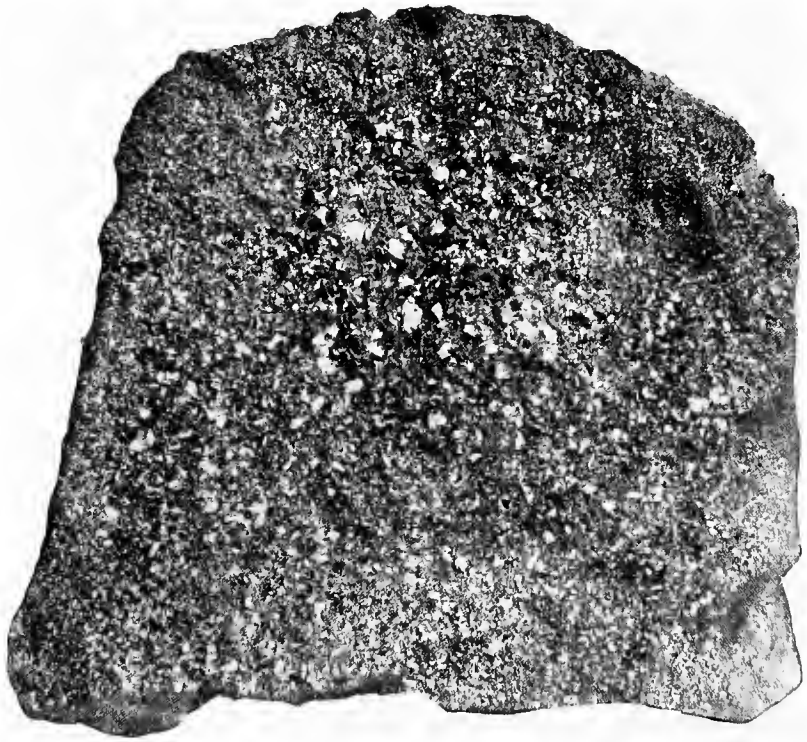


WHITE TRUSSVILLE.

ALABAMA (Continued)

TUTWILER COAL, COKE AND IRON COMPANY, Birmingham, Jefferson County. Stacks, 1. Capacity, 36,000 tons per year. Fuel, coke. Ores, red fossil and brown hematite. Brand, "Vanderbilt."

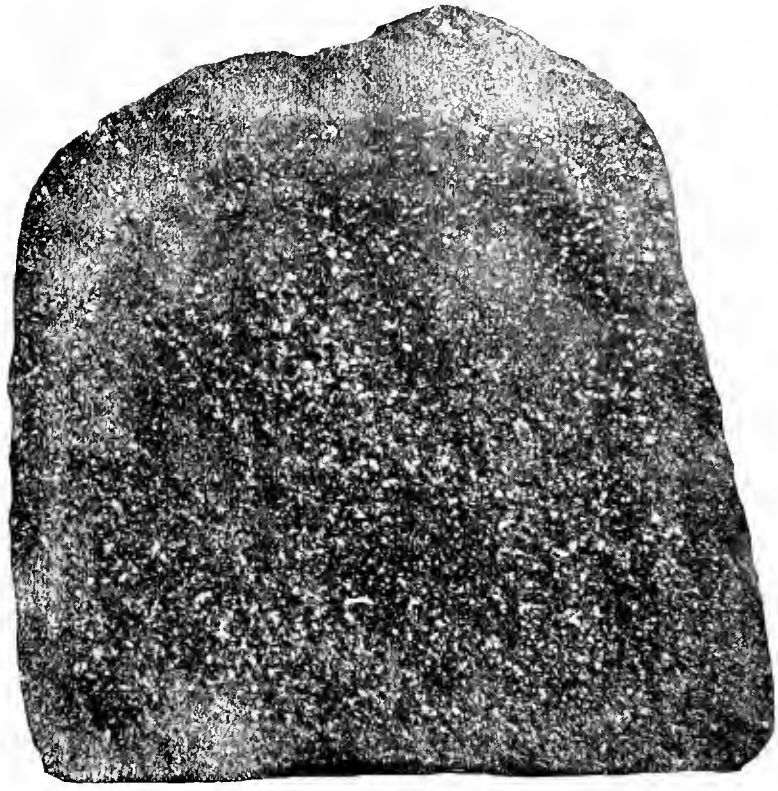
	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	No. 1 Soft.	No. 2 Soft.	Mottled.	Grey Forge
Silicon	3.12	2.990	2.18	2.380	3.250	4.490	2.610	2.680
Phosphorus	....	....	....	.....	1.050	....	1.069	.790
Sulphur	....	.045	....	.095	.022	.016	.....	.089
Manganese	....	.100	...	.....	.....	.....	.	.140



No 1 FOUNDRY VANDERBILT.

ALABAMA (Continued)

TUTWILER COAL, COKE AND IRON COMPANY.



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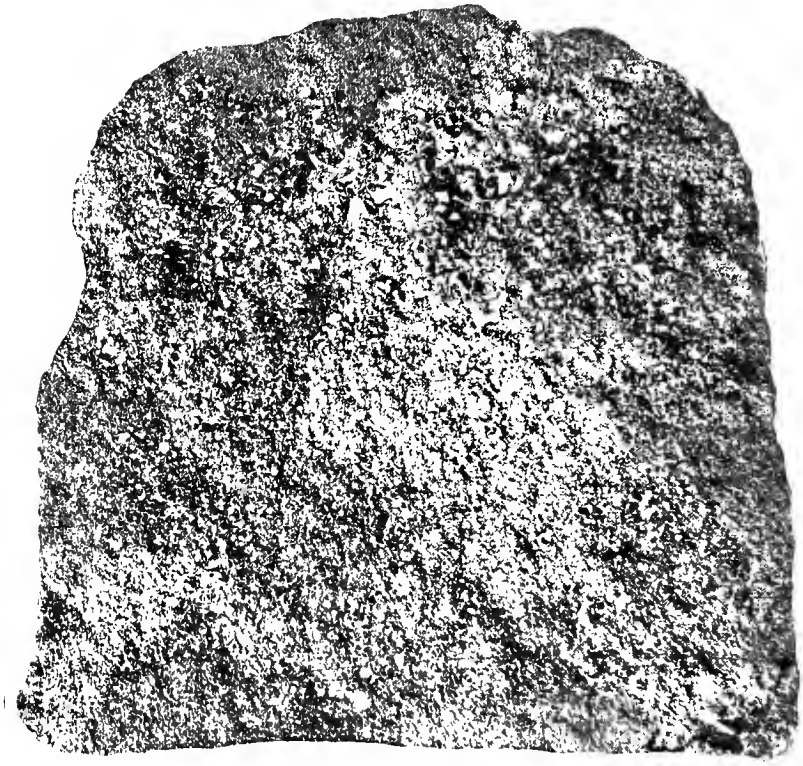


No. 1 SOFT VANDERBILT.

ALABAMA (Continued)

TUTWILER COAL, COKE AND IRON COMPANY.

No. 2 SOFT VANDERBILT.

WOODSTOCK IRON WORKS, THE—Anniston, Calhoun County. Woodstock Furnaces. Stacks, 2. Total capacity, 60,000 tons per year. Fuel, Alabama coke. Ore, local brown hematite. Brand, "Woodstock."

	No. 2 Foundry.	No. 3 Foundry.	No. 1 Soft.	No. 2 Soft.	Grey Forge.
Silicon	1.727	1.073	2.193	2.333	.933
Phosphorus	.539	.546	.772	.728	.752
Sulphur	.004	.016	.007	.008	.020
Manganese	1.129	.908	.786	.908	.834
Combined Carbon	.560	.640	.328	.360	.520
Graphitic Carbon	3.322	3.216	3.412	3.362	3.216

WOODWARD IRON COMPANY, Woodward, Jefferson County. Stacks, 2. Total capacity, 100,000 tons per year. Fuel, coke. Ore, red fossiliferous. Brand, "Woodward."

Could not obtain analysis of this iron.

COLORADO

COLORADO FUEL AND IRON COMPANY, THE—Pueblo, Pueblo County. Stacks, 3. Total capacity, 200,000 tons per year. Fuel, coke. Ores, limonite and magnetite.

Could not obtain analysis of this iron.

CONNECTICUT

BARNUM–RICHARDSON COMPANY, East Canaan, Litchfield County. Canaan Furnaces. Stacks, 2. Total capacity, 10,000 tons per year. Fuel, charcoal. Ore, Salisbury brown hematite. Brand, "Salisbury."

	No. 2.	No. 3.	No. 4.
Silicon	1.600	.920	.74
Phosphorus	.290	.290	.32
Sulphur	.025	.028	.04
Manganese	.620	.560	.43
Combined Carbon	.150	.280	.75
Graphitic Carbon	3.590	3.260	2.49

LIME ROCK IRON COMPANY, Lime Rock, Litchfield County. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ore, Salisbury brown hematite.

Analysis same as Barnum–Richardson Company. See above.

SALISBURY CARBONATE IRON COMPANY, Chapinville, Litchfield County. Landon Furnace. Stacks, 1. Capacity, 4500 tons per year. Fuel, charcoal. Ores, roasted carbonate from Amenia, New York, and Kelley, Amenia, and Shaker hematites. Brands, "Salisbury" and "Carbonate."

	CARBONATE.				
	No. 2.	No. 3.	No. 4.	No. 4½.	No. 5.
Silicon	1.843	1.290	.733	.676	.368
Phosphorus	.254	.300	.329	.225	.290
Sulphur	.049	.045	.044	.035	.042
Manganese	.400	400	.650	.120	.160
Combined Carbon	.080	.120	.160	.900	.900
Graphitic Carbon	3.900	3.120	2.980	2.320	1.850

CONNECTICUT (Continued)

SALISBURY CARBONATE IRON COMPANY.

No. 3 CARBONATE

No. 4 CARBONATE

GEORGIA.

ALABAMA AND GEORGIA IRON COMPANY, Cedartown, Polk County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, Charcoal (only). Ores, red and brown hematite. Brand, "Cherokee."

Grade by Fracture.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.020	.860	780	.570	490
Phosphorus	.399	.413	.491	.482	.478
Sulphur	.020	.022	.024	.028	.039
Manganese	.600	.610	.640	.520	.580

NOTE.—Corrected analyses furnished by Rogers, Brown & Co., Cincinnati. October 6, 1900.

Please paste this on page 27 in Vol. 1, Analyses of Pig Iron, by S. R. Church.

CONNECTICUT (Continued)

SHARON VALLEY IRON COMPANY, Sharon Valley, Litchfield County. Stacks, 1. Capacity, 4500 tons per year. Fuel, charcoal. Ore, Salisbury.

Analysis same as Barnum-Richardson Company. See page 25.

GEORGIA

ALABAMA AND GEORGIA IRON COMPANY, Cedartown, Polk County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, charcoal and coke. Ores, red and brown hematite. Brand, "Cherokee"

	No. 1.	No. 2.	No. 3.	No. 5.	Grey Forge.	Silvery Grey.
Silicon	3.060	2.360	1.670	2.440	3.680	5.060
Phosphorus	.934	1.008	.985	.355	.386	.638
Sulphur	.036	.024	.017	.011	.013	.083
Manganese	.412	.147	....	.324	....	....
Combined Carbon	.510	.545	.570	.320	....	..
Graphitic Carbon	2.590	2.800	2.640	2.600	...	....

ETNA MANUFACTURING COMPANY, Etna, Polk County. Etna Furnace. Stacks, 1. Capacity, 10,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Etna."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.080	.920	1.460	1.019	.544
Phosphorus	.420	.501	.602	.690	.462
Sulphur	....	....	....	....	...
Manganese	Trace	.015	.032	.200	Trace
Combined Carbon	.743	1.002	.880	1.160	.822
Graphitic Carbon.	1.368	1.460	1.980	1.590	1.421

ROME FURNACE COMPANY, THE—Rome, Floyd County. Rome Furnace. Stacks, 1. Capacity, 15,500 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Rome."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.970	1.219	.560	.470	.700
Phosphorus	.037	.415	.340	.350	.266
Sulphur	Trace	Trace	Trace	.002	Trace
Manganese	.719	.813	.940	.600	.110
Combined Carbon	.184	.421	.690	.490	.850
Graphitic Carbon.	3.088	2.820	2.570	3.440	2.320

GEORGIA (Continued)

SOUTHERN MINING COMPANY, Rising Fawn, Dade County. Rising Fawn Furnace. Stacks, 1. Capacity, 36,000 tons per year. Fuel, coke. Ores, brown and red. Brand, "Rising Fawn."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 1 Soft.	No. 2 Soft.	Grey Forge.
Silicon	2.98	2.90	2.62	3.26	3.24	2.25
Phosphorus	1.18	1.32	1.27	1.42	1.19	1.26
Sulphur	....	....	....	...	....	....
Manganese	.21	.19	.23	.12	.42	.15
Combined Carbon	.12	.08	.12	.15	.09	.09
Graphitic Carbon	2.78	2.79	2.99	2.78	3.38	3.11

ILLINOIS

CALUMET IRON AND STEEL COMPANY, South Chicago, Cook County. Calumet Furnace. Stacks, 1. Capacity, 75,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Calumet."

	Average Analysis.
Silicon	2.640
Sulphur	.007
Combined Carbon	.250
Graphitic Carbon	3.010

ILLINOIS (Continued)

ILLINOIS STEEL COMPANY, Chicago.

Name of Works.	Location.	County	Fuel.	Total No. of Stacks.	Annual Capacity.
North Works	Chicago	Cook	Connellsville and Pocahontas coke	2	70,000 tons
South Works	S. Chicago	Cook	" " "	8	850,000 "
Union Works	Chicago	Cook	" " "	2	130,000 "
Joliet Works	Joliet	Will	" " "	3	300,000 "

Ores, Lake Superior, Gogebic, and Minnesota for Bessemer pig iron, and foreign. Southern, and Western for spiegeleisen and ferromanganese.

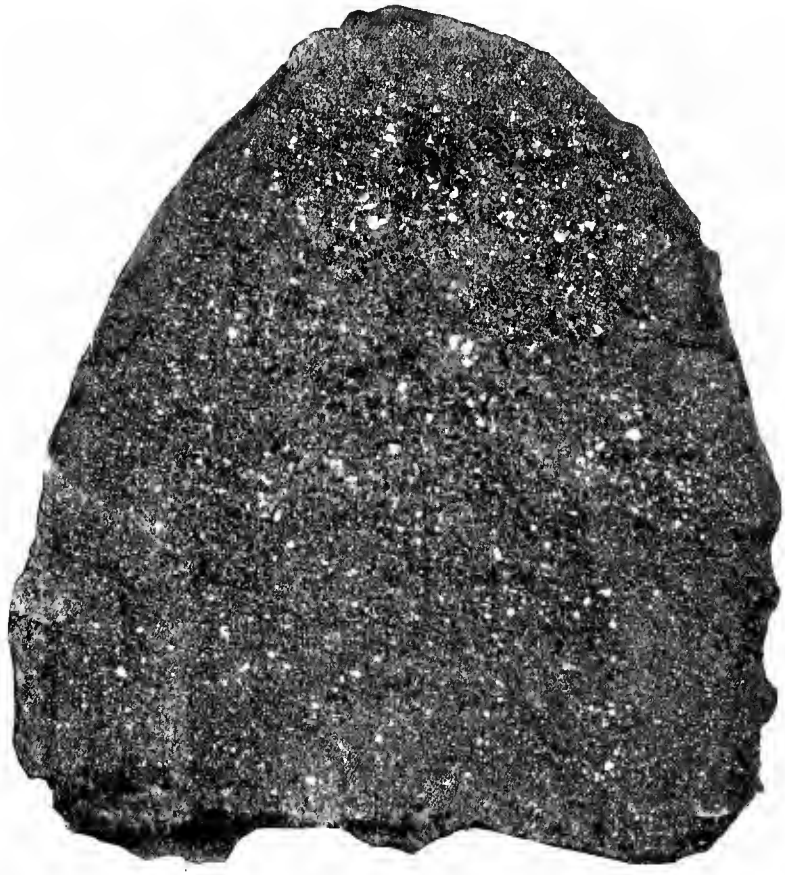
	Bessemer.	Malleable Bessemer.	Basic Open Hearth.
Silicon	.750 to 1.50	.75 to 2.00	not over .75
Phosphorus	.065 to .09	.10 to .20	.75 to 1.50
Sulphur	below .05	below .05	below .05
Manganese	.75	.60 to 1.40	.75 to 1.25

IROQUOIS IRON COMPANY, South Chicago, Cook County. Iroquois Furnace. Stacks, 1. Capacity, 80,000 tons per year. New furnace building, estimated annual capacity after completion of second furnace, 180,000 tons. Fuel, coke. Ore, Lake Superior. Brands, "Iroquois," "Sterling Scotch," "Peerless" and "Mill."

	Iroquois					
	No. 1.	No. 2.	No 3.	Sterling Scotch.	Peerless.	Mill.
Silicon	2.25 to 2.50	1.75 to 2.25	1.35 to 1.75	2.50 to 3.00	3.00 to 3.50	....
Phosphorus	.30 to .40	.30 to .40	.30 to .40	.30 to .40	.30 to .40	.30 to .40
Sulphur	.02 to .05	.02 to .05	.02 to .06	.02 to .04	.02 to .04	.04 & up.
Manganese	.40 to .60	.40 to .60	.40 to .60	.40 to .60	.40 to .60	.40 to .60

ILLINOIS (Continued)

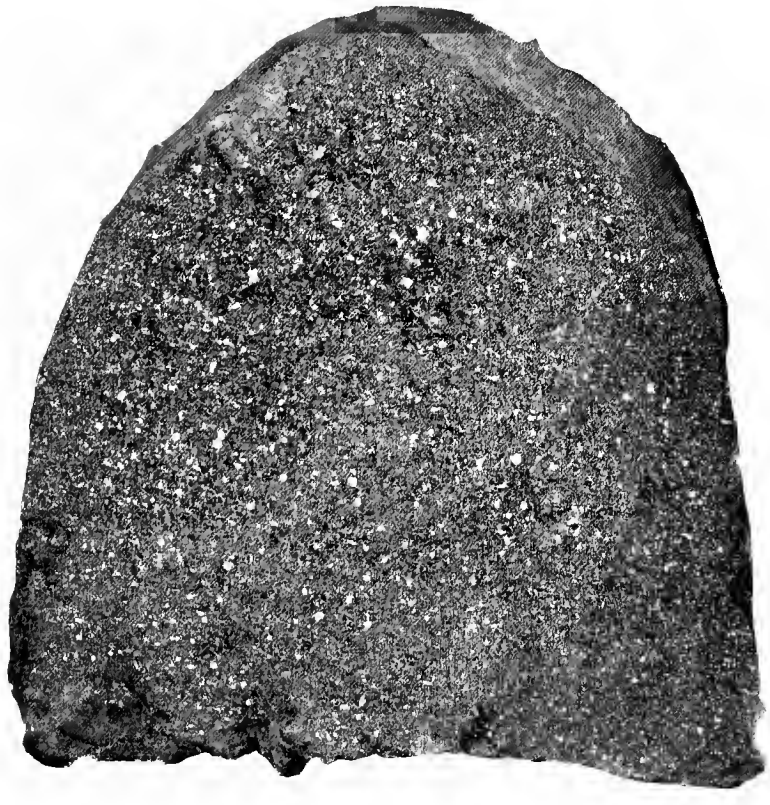
IROQUOIS IRON COMPANY.



No. 1 IROQUOIS

ILLINOIS (Continued)

IROQUOIS IRON COMPANY.



No. 2 IROQUOIS

ILLINOIS (Continued)

IROQUOIS IRON COMPANY.

No. 3 IROQUOIS

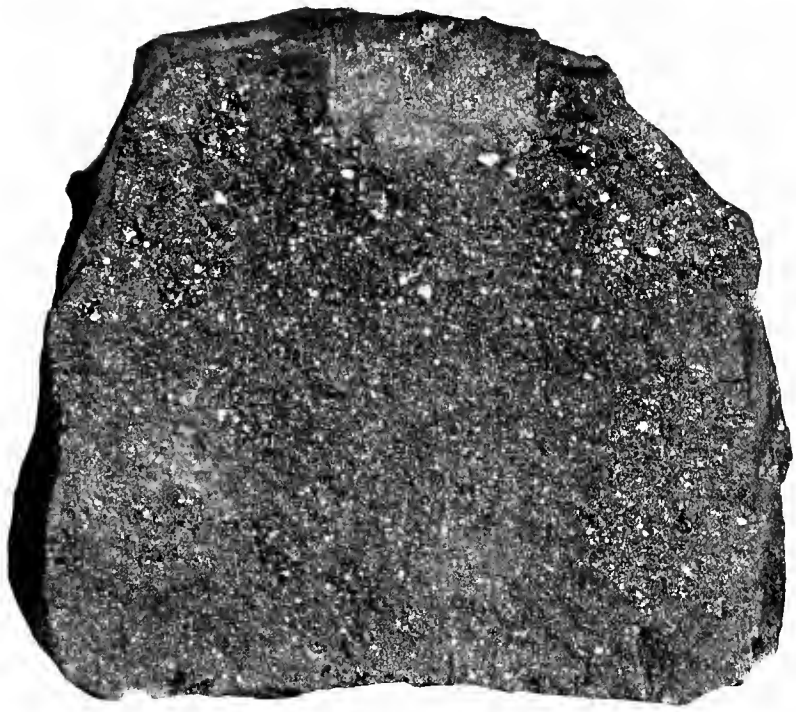
ILLINOIS (Continued)

IROQUOIS IRON COMPANY.

STERLING SCOTCH (IROQUOIS)

ILLINOIS (Continued)

IROQUOIS IRON COMPANY.



PEERLESS (IROQUOIS)

KENTUCKY

ASHLAND COAL AND IRON RAILWAY COMPANY, Ashland, Boyd County. Ashland Furnaces. Stacks, 3. Total capacity, 50,000 tons per year. Fuel, raw coal and coke. Ores from Bath County. Brand, " Ashland."

Could not obtain analysis of this iron.

COLUMBIAN LAND AND MINING COMPANY, THE—Grand Rivers, Livingston County. Grand Rivers Furnaces. Stacks, 2. Total capacity, 45,000 tons per year. Fuel, charcoal. Ore, local brown hematite. Brand, "Grand Rivers."

Could not obtain analysis of this iron.

MEANS & RUSSELL IRON COMPANY, Greenup County. Bellefonte Furnace. Stacks, 1. Capacity, 4500 tons per year. Fuel, charcoal. Ore, limonite. Brand, " Bellefonte."

Could not obtain analysis of this iron.

PADUCAH FURNACE, Paducah, McCracken County. Stacks, 1. Capacity, 30,000 tons per year. Fuel, Connellsville coke. Ore, local brown hematite. Brand, " Boone."

Could not obtain analysis of this iron.

VIRGINIA IRON, COAL AND COKE COMPANY, Middlesborough, Bell County. Watts Furnaces. Stacks, 2. Total capacity, 75,000 tons per year. Fuel, Middlesborough coke. Ores, fossil and hematites. Brand, "Watts."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	No. 2 Soft.	Foundry Forge.	Grey Forge.
Silicon	2.92	2.40	2.10	1.700	3.400	1.50	1.400
Phosphorus	.74	75	.75	.780	.740	78	.780
Sulphur	.02	.02	.02	.033	.018	.04	.042
Manganese	48	.47	.45	450	.480	.45	.450
Combined Carbon	.11	.11	.18	.240	.090	.26	.360
Graphitic Carbon	3.47	3.45	3.31	3.300	3.520	3.28	3.120

MARYLAND

BLUE MOUNTAIN IRON AND STEEL COMPANY, Catoctin, Frederick County. Stacks, 1. Capacity, 35,000 tons per year. Fuel, Connellsville coke. Ore, local hematite. Brand, "Catoctin."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 1. Soft.	No. 2. Soft.
Silicon	2.50	2.25	2.00	1.60	3.00	3.50
Phosphorus	.50	.50	.50	.50	.50	.50
Sulphur	.02	.03	.04	.05	.03	.04
Manganese	.50	.50	.50	.50	.50	.50
Combined Carbon	.20	.30	.50	.70	.25	.40
Graphitic Carbon	3.50	3.35	3.10	2.85	3.50	3.25

MARYLAND STEEL COMPANY, Sparrow's Point, Baltimore County. Stacks, 4. Total capacity, 358,000 tons per year. Fuel, Connellsville coke. Ores, hematite from Cuba, Spain, Africa and Newfoundland.

Could not obtain analysis of this iron.

MUIRKIRK FURNACE, THE—Muirkirk, Prince George County. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ores, roasted carbonate and hematite. Brand, "Muirkirk."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 4¼.	No. 4½.	No. 4¾.
Silicon	2.210	1.480	1.740	1.530	1.110	.620	.730
Phosphorus	.280	.292	.293	.296	.270	.289	.281
Sulphur	.031	.044	.044	.040	.075	.056	.066
Manganese	2.220	1.740	1.810	1.500	1.230	1.080	.850
Combined Carbon	.550	.540	.430	.600	.650	.700	.410
Graphitic Carbon	3.010	3.160	2.980	2.720	2.270	2.600	2.470

STICKNEY IRON COMPANY, THE—Canton, Baltimore County. Stacks, 1. Capacity, 6000 tons per year. Fuel, charcoal. Ore, Baltimore carbonate. Brand, "Stickney."

Could not obtain analysis of this iron.

MASSACHUSETTS

RICHMOND IRON WORKS, Berkshire County. Stacks, 1 at Richmond, 1 at Van Deusenville and 1 at Cheshire. Total capacity, 15,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Richmond."

	No. 2.	No. 3.	No. 4.
Silicon	2.198	1.423	.616
Phosphorus	.392	.379	.354
Sulphur	.020	.017	.013
Manganese	1.165	.896	.564
Combined Carbon	.240	.270	.760
Graphitic Carbon	3.420	3.300	2.700

MICHIGAN

ANTRIM IRON COMPANY, Mancelona, Antrim County Antrim Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, charcoal. Ore, Lake Supeior. Brand, "Antrim."

	A 1.	B 1.	C 1.	D 1.	S 2.	H 2.	S 3.	H 3.	S 4.	H 4.	5.	6.
Silicon	2.000 to 2.300	1.750 to 2 000	1.500 to 1.750	1.250 to 1.500	1.000 to 1.250	.750 to 1.000	.550 to 750	400 to .550	.300 to .400	.200 to .300	.100 to .200	.000 to .100
Phosphorus	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212	.182 to .212
Sulphur	.014	.014	.014	.014	.014	.014	.015	.015	.015	.015	.016	.016
Manganese	.686	.686	.686	.686	.652	.652	.525	.525	.309	.309	.151	.098
Combined Carbon	.400	.400	400	.400	.550	.550	.830	.830	.950	.950	1.280	1.760
Graphitic Carbon	3.420	3.420	3.420	3.420	3.310	3.310	2.970	2.970	2.620	2.620	1.750	1.090

For Grading Card see page 40.

DETROIT IRON FURNACE COMPANY, Detroit, Wayne County. Stacks, 1. Capacity, 20,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "D. I. F."

Could not obtain analysis of this iron.

ELK RAPIDS FURNACE, Elk Rapids, Antrim County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Elk Rapids."

For Grading Card, see page 40.

EXCELSIOR FURNACE, Ishpeming, Marquette County. Stacks, 1. Capacity, 27,500 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Excelsior."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.420	1.360	1.000	.450	.250
Phosphorus	.252	.252	.243	.240	.250
Sulphur	.010	.010	.012	.013	.016
Manganese	.610	.530	.410	.300	.280
Combined Carbon	.520	.560	.580	.730	.940
Graphitic Carbon	2.560	2.560	2.450	2.400	1.850

For Grading Card, see page 40.

MICHIGAN (Continued)

GAYLORD IRON COMPANY, Detroit, Wayne County. Stacks, 1. Capacity, 12,000 tons per year. Fuel, charcoal. Ores, Lake Superior specular, magnetic, and hematite. Brand, "Gaylord."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.850	1.700	.620	.450	.320
Phosphorus	.170	....	.....	.....	....
Sulphur	.008	.....	.....	.....	.014
Manganese	.500	....	....	....	.....
Combined Carbon	.600	.590	.500	.670	.930
Graphitic Carbon	3.300	2.830	2.800	2.600	2.500

GRADING CARD.

Grades.	SILICON. Average %	Variation %	
"Scotch"	All	above 2.00	
No. 1 "A"	1.85	1.70 to 2.00	
No. 1 "B"	1.60	1.50 to 1.70	
No. 2 "Soft"	1.35	1.20 to 1.50	
No. 2 "Regular"	1.05	.90 to 1.20	
No. 2 "Hard"	.82	.75 to .90	
No. 3 "Low"	.67	.60 to .75	
No. 3 "High"	.62	.55 to .70	Chill ½″
No. 4 "Low"	..	Chills 1″	
No. 4½.		" 1½″	
No. 4 "High"		" 1¾″ and top and bottom of pig	
No. 5 "Low"		Low Mottled Iron	
No. 5 "High"		High Mottled Iron	
No. 6	..	White Iron	
Phosphorus	.15 to .200		
Manganese	.30 to 1.200		
Sulphur	Trace to .016		

MICHIGAN (Continued)

MARTEL FURNACE, St. Ignace, Mackinac County. Stacks, 1. Capacity, 21,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Martel."

Could not obtain analysis of this iron.

NEWBERRY FURNACE COMPANY, Newberry, Luce County. Stacks, 1. Capacity, 27,000 tons per year. Fuel, charcoal. Ores, hard and soft Lake Superior. Brand, "Vulcan."

Could not obtain analysis of this iron.

NORTHERN FURNACE COMPANY, Chocolay, Marquette County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Northern."

Could not obtain analysis of this iron.

PIONEER FURNACE, Gladstone, Delta County. Stacks, 1. Capacity, 72,436 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Pioneer."

For Grading Card, see page 40.

PENINSULAR IRON COMPANY, THE—Detroit, Wayne County. Peninsular Furnace. Stacks, 1. Capacity, 10,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Peninsular."

GRADING CARD.

Grades.	SILICON. Average %	Variation %	
"Special 1"	2.00	or over	
No. 1 "X"	1.75	1.60 to 1.90	
No. 1	1.50	1.35 to 1.60	
No. 1 "A"	1.25	1.15 to 1.35	
No. 1 "B"	1.25		
No. 1 "C"	.97	.80 to 1.15	
No. 2 "Soft"	1.10	1.00 to 1.25	
No. 2 "Medium"	.90	.80 to 1.00	
No. 2 "Hard"	.80	70 to .90	
No. 3 "Soft"	.62	.55 to .75	
No. 3 "Medium"	.55	.50 to .60	Chill ⅛″
No. 3 "Hard"	.54		" ¼″
No. 4 "Soft"	.50		" ½″
No. 4 "Medium"	.47		" ¾″
No. 4 "Hard"	.35		" 1 to 1½″
No. 5 "Soft"	.27	.25 to .30	
No. 5 "Hard"	.25	Mottled	
No. 6	.10	White iron	
Phosphorus		.150 to .190	
Manganese		.250 to 1.000	
Sulphur		Trace to .015	

MICHIGAN (Continued)

Superior Charcoal Iron Company, Grand Rapids.

Name of Furnace.	Location.	County.	Fuel.	Ore.	No. of Stacks.	Annual Capacity.	Brand.
Pioneer	Gladstone	Delta	Charcoal	Lake Superior	1	72,436 tons	"Pioneer"
Antrim	Mancelona	Antrim	"	"	1	30,000 tons	"Antrim"
Elk Rapids	Elk Rapids	Antrim	"	"	1	25,000 tons	"Elk Rapids"
Excelsior	Ishpeming	Marquette	"	"	1	27,500 tons	"Excelsior"

GRADING CARD.

PIONEER.

Grade.	Silicon.	Chill test of pig.
A Scotch	2.60 to 2.90	.....
B Scotch	2.40 to 2.60	.....
C Scotch	2.10 to 2.40	.....
No. 1 Special	1.75 to 2.10	.....
No. 1 Foundry	1.40 to 1.75	.....
No. 2 Low	1.15 to 1.40	.....
No. 2 High	.90 to 1.15	.....
No. 3 Low	.65 to .90	.....
No. 3 High	45 to .65	¼ to ⅝ in.
No. 4 Low	.35 to .45	⅝ to 1 in.
No. 4 High	.25 to .35	1 to 1½ in.
No. 5	.10 to .25	Mottled
No. 6	.00 to .10	White

Phosphorus..... .15 to .220
Manganese..... .30 to .700
Sulphur.....Trace to .018

ANTRIM.

Grade.	Silicon.	Chill test of pig.
No. 1 A	2.00 to 2.30	.....
No. 1 B	1.75 to 2.00	.....
No. 1 C	1.50 to 1.75	.....
No. 1 D	1.25 to 1.50	.....
No. 2 Soft	1.00 to 1.25	.....
No. 2 Hard	.75 to 1.00	.....
No. 3 Soft	.55 to .75	⅛ to ⅜ in.
No. 3 Hard	.40 to .55	⅜ to ¾ in.
No. 4 Soft	.30 to 40	¾ to 1¼ in.
No. 4 Hard	.20 to .30	1¼ to 2 in.
No. 5	.10 to .20	Mottled
No. 6	.00 to .10	White
.....	.....	.....

Phosphorus..... .15 to .220
Manganese..... .30 to .700
Sulphur.....Trace to .018

ELK RAPIDS.

Grade.	Silicon.	Chill test of pig.
Sp'l No. 1 A	2.00 and over	.....
Sp'l No. 1 B	1 80 to 2.00	.....
Sp'l No. 1 C	1.60 to 1.80	.....
No. 1 A	1.40 to 1.60	.....
No. 1 B	1.20 to 1.40	.....
No. 2 A	1.00 to 1.20	.....
No. 2 B	80 to 1.00	.....
No. 3 A	.65 to .80	.....
No. 3 B	.50 to .65	¼ to ½ in.
No. 4 A	.35 to .50	½ to 1 in.
No. 4 B	.20 to .35	1 to 1½ in.
No. 5	.10 to .20	Mottled
No. 6	.00 to .10	White

Phosphorus..... .15 to .220
Manganese..... .30 to .800
Sulphur.....Trace to .018

EXCELSIOR.

Grade.	Silicon.	Chill test of pig.
A Scotch	2.60 to 2.90	.....
B Scotch	2.10 to 2.60	.....
No. 1 Soft	1.85 to 2.10	.....
No. 1 Special	1.60 to 1.85	.....
No. 1	1.30 to 1.60	.....
No. 2 Low	1 00 to 1.35	.....
No. 2 High	.90 to 1.15	.....
No. 3 Low	.75 to 1.00	.....
No. 3 High	.55 to .70	¼ to ⅝ in.
No. 4 Low	.40 to .55	⅝ to 1 in.
No. 4 High	.30 to .45	1 to 1½ in.
No. 5	.10 to .25	Mottled
No. 6	.00 to .10	White

Phosphorus..... .15 to .220
Manganese..... .30 to .700
Sulphur.....Trace to .018

Car Wheel Iron graded by grain and chill. All other irons by analysis. Special Low Phosphorus and High Manganese Irons made on specifications.

MICHIGAN (Continued)

SPRING LAKE IRON COMPANY, THE—Fruitport, Muskegon County. Fruitport Furnace. Stacks, 1. Capacity, 29,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Spring Lake."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.400	1.100	.850	.600	.400
Phosphorus.	.200	.200	.220	.240	.240
Sulphur	.015	.015	.018	.020	.020
Manganese	.600	.600	.500	.460	.420

UNION IRON COMPANY, Detroit, Wayne County. Stacks, 1. Capacity, 13,500 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "U. I. Co., Det."

Could not obtain analysis of this iron.

WESTON FURNACE COMPANY, Manistique, Schoolcraft County. Weston Furnace. Stacks, 1. Capacity, 34,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Champion."

Could not obtain analysis of this iron.

MINNESOTA

DULUTH FURNACE COMPANY, West Duluth, St. Louis County. West Duluth Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, Connellsville and Pocahontas coke. Ore, Mesabi.

	Bessemer.
Silicon	1.500
Phosphorus	.085
Sulphur	.020
Manganese	.600

MISSOURI

McNAIR AND DECAMP, South St. Louis. Missouri Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, Connellsville coke. Ores, Iron Mountain and Cherry Valley. Brand, "Carondelet Scotch."

	No. 1.	No. 2.	Malleable Bessemer.	Basic.
Silicon	3.000	1.50 to 2.000	1.00 to 1.50	1.00 and under
Phosphorus	.400	.400	.20	.20 to .30
Sulphur	.005	.005	.05 and under	.05 and under
Manganese	.400	.400	.30 to 1.00	.30 to .40

SLIGO FURNACE COMPANY, Sligo, Dent County. Stacks, 1. Capacity, 20,000 tons per year. Fuel, charcoal. Ores, blue specular and red oxide. Brand, "Sligo."

Could not obtain analysis of this iron.

NEW JERSEY

ANDOVER IRON COMPANY, Phillipsburg, Warren County. Stacks, 1. Capacity, 40,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetic and Lake Superior red hematite. Brand, "Andover."

Silicon	.25 to 4.000
Phosphorus	.40 to .500
Sulphur	Trace to .010
Manganese	.12 to .200

NEW JERSEY (Continued)

EMPIRE STEEL AND IRON COMPANY, Oxford, Warren County. Oxford Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, anthracite coal and Connellsville coke. Ore, magnetic. Brand, "Oxford."

	No. 1.	No. 2.	No. 3.	Grey Forge.	Basic.
Silicon	2.70	2.250	2.00	1.25	1.00 and under.
Phosphorus	.72	.720	.72	.72	Under 1.00
Sulphur	.02	.025	.04	.06	.05 or under.
Manganese	.50	.500	.50	.50	1.00 or under.
Combined Carbon	.22	.270	.30	.60	...
Graphitic Carbon	3.15	3.000	2.75	2.81	....

MUSCONETCONG IRON WORKS, THE—Stanhope, Sussex County. Musconetcong Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, anthracite coal and coke. Ore, magnetic mined in Morris and Sussex Counties. Brand, "Musconetcong."

This Company makes Bessemer Iron for their own consumption.

NEW JERSEY ZINC COMPANY, THE—Hudson County. Hudson County Furnace. Stacks, 1. Capacity, 9000 tons per year. Fuel, anthracite coal.

Could not obtain analysis of this iron.

NEW JERSEY ZINC COMPANY, THE—Newark, Essex County. Newark Furnaces. Stacks, 2. Total capacity, 10,000 tons per year. Fuel, anthracite coal and coke.

Could not obtain analysis of this iron.

PEQUEST FURNACE, Oxford, Warren County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, anthracite coal and Connellsville coke. Ores, New Jersey magnetic and foreign. Brand, "Pequest."

Could not obtain analysis of this iron.

NEW JERSEY (Continued)

SECAUCUS IRON COMPANY, Secaucus, Hudson County. Stacks, 1. Capacity, 27,000 tons per year. Fuel, anthracite coal. Ores, foreign hematite and New York and New Jersey magnetic. Brand, "Secaucus."

Could not obtain analysis of this iron.

WHARTON FURNACE, Port Oram, Morris County. Stacks, 1. Capacity, 50,000 tons per year. Fuel, anthracite coal and coke. Ores, Hibernia (New Jersey) magnetic and Lake Superior hematite. Brand, "Wharton."

	No. 1 X.	No. 2 X.	No. 2 Plain.
Silicon	2.500 to 2.750	2.250 to 2.500	1.75 to 2.00
Phosphorus	.750	.750	.75
Sulphur	.009	.015	.02
Manganese	.300	.330	.33
Combined Carbon	.330	.400	.45
Graphitic Carbon	3.850	3.650	3.55

NEW YORK

AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, Crown Point, Essex County. Crown Point Furnaces. Stacks, 1. Capacity, 40,000 tons per year. Fuel, anthracite coal and coke. Ores, Crown Point and Chateaugay. Brand, "Crown Point."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	3.000	2.70	2.00	1.60	1.00
Phosphorus	.875	....	....	....	....
Manganese	.500	....	....	....	...

NEW YORK (Continued)

BUFFALO CHARCOAL IRON COMPANY, Buffalo, Erie County. Stacks, 1. Capacity, 55,000 tons per year. Fuel, charcoal. Ore, Lake Superior. Brand, "Baird."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Silicon	1.40	1.10	.80	.50	.35	.15
Phosphorus	15	.15	.15	.15	.15	.15
Sulphur	Trace	Trace	Trace	Trace	Trace	Trace
Manganese	.70	.70	.70	.70	.70	.70
Combined Carbon	.20	.35	.50	.65	.85	..
Graphitic Carbon	3.75	3.60	3.30	3.00	2.75	...

BUFFALO FURNACE COMPANY, Buffalo, Erie County Buffalo Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Buffalo."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3	Scotch.
Silicon	2.500	2.500	2.50	2.000	3.000
Phosphorus	.400	.400	.40	.400	.450
Sulphur	.015	.015	.03	.035	.015
Manganese	.600	.500	.50	400	.600
Combined Carbon	.160	.160	.20	.250	.150
Graphitic Carbon	3.750	3.600	3.40	3.250	3 500

BURDEN IRON COMPANY, THE—Troy, Rensselaer County. Stacks, 2. Total capacity, 50,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetic from Northern New York; hematite and carbonate from Eastern New York, and Lake Superior.

Could not obtain analysis of this iron.

CEDAR POINT FURNACE, Port Henry, Essex County. Stacks, 1. Capacity, 36,000 tons per year. Fuel, anthracite coal and coke. Ores, Old Bed Lake Champlain and New Bed Bessemer Lake Champlain. Brand, "Cedar Point."

	No. 2 Plain.
Silicon	1.700
Phosphorus	1.590
Sulphur	.023
Manganese	Trace.
Combined Carbon	.250
Graphitic Carbon	2.940

CHARLOTTE IRON WORKS, Charlotte, Monroe County. Charlotte Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, anthracite coal and coke. Ores, local hematite with a mixture of Lake Champlain and Lake Superior magnetic. Brand, "Charlotte."

	No. 1.
Silicon	3.436
Phosphorus	.872
Sulphur	.024
Manganese	.078
Combined Carbon	.062
Graphitic Carbon	3.424

NEW YORK (Continued)

KIRKLAND FURNACE, Kirkland, Oneida County. Stacks, 1. Capacity, 18,000 tons per year. Fuel, anthracite coal and coke. Ores, local fossiliferous, Northern New York hematite, and Lake Champlain magnetic. Brand "Kirkland."

	No. 1 X.
Silicon	3.0800
Phosphorus	1.2700
Sulphur	.0274
Manganese	.9700
Graphitic Carbon	3.5500

PHENIX FURNACE, Millerton, Dutchess County. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ore, Salisbury from Salisbury Mine at Ore Hill. Brand, "Phenix."

Could not obtain analysis of this iron.

POUGHKEEPSIE IRON COMPANY, Poughkeepsie, Dutchess County. Stacks, 2. Total capacity, 68,000 tons per year. Fuel, anthracite coal and coke. Ores, brown hematite and magnetic. Brand, "Poughkeepsie."

Could not obtain analysis of this iron.

SALISBURY CARBONATE IRON COMPANY, Columbia County. Chatham Furnace at Chatham and Copake Iron Works. Stacks, 2. Total capacity, 10,000 tons per year. Fuel, charcoal. Ores, roasted carbonate from Amenia, New York, and Kelley, Amenia, and Shaker hematites. Brands, "Salisbury" and "Carbonate."

Analysis of this iron is the same as that made by this company at their furnace at Chapinville, Conn. See page 25.

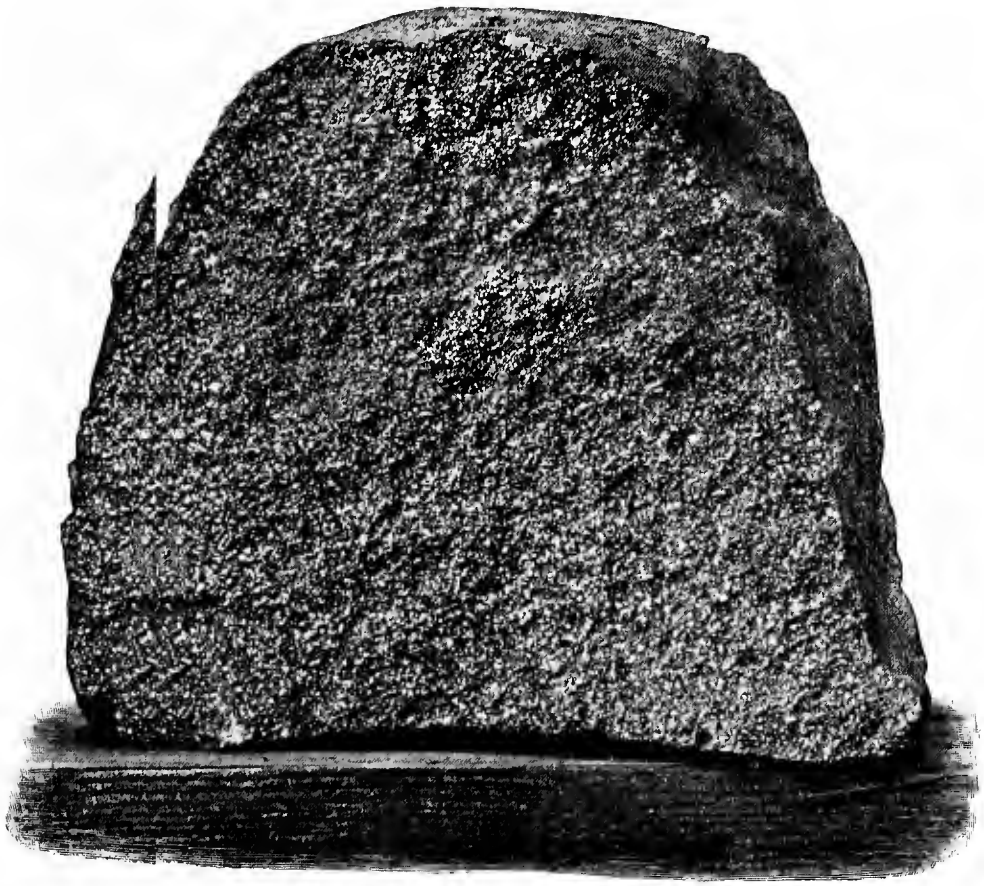
TONAWANDA IRON AND STEEL COMPANY, North Tonawanda, Niagara County. Niagara Furnaces. Stacks, 2. Total capacity, 165,000 tons per year. Fuel, coke. Ores, hematite and specular from Lake Superior. Brands, "Niagara" and "Tonawanda."

	Niagara				
	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 2 Plain Soft.	Grey Forge.
Silicon	2.50	2.25	2.00	2.75	1.80
Phosphorus	.45	.45	.45	.45	.45
Sulphur	.03	.04	.05	.04	.06
Manganese	.60	.60	.60	.60	.60
Combined Carbon	.39	40	.41	....	....
Graphitic Carbon	3.33	3.18	3.29	....	....

	Tonawanda			
	No. 1.	No. 2 X.	No. 2 Plain.	Grey Forge.
Silicon	3.00	2.750	2.500	2.00
Phosphorus	.70	.700	.700	.70
Sulphur	.03	.040	.045	.06
Manganese	.75	750	.750	.75
Combined Carbon	.33	.280	.....	....
Graphitic Carbon	3.13	3.085	.....	....

NEW YORK (Continued)

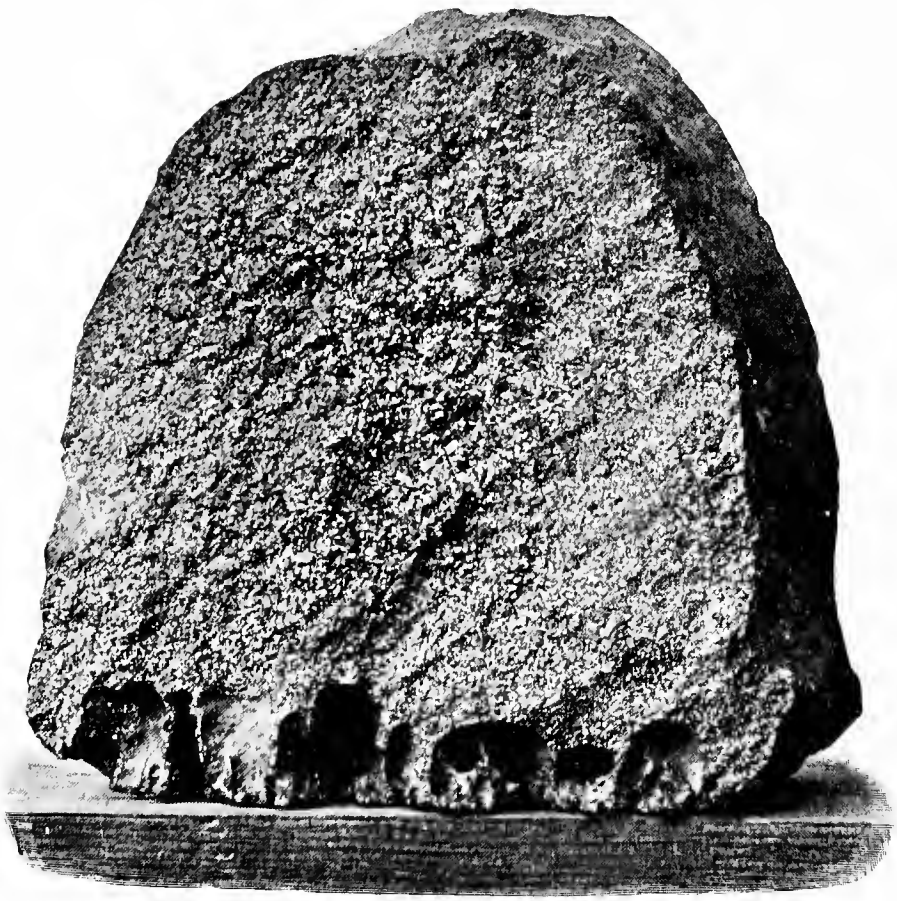
TONAWANDA IRON AND STEEL COMPANY.



NO. 3 NIAGARA (AMERICAN BARROW)

NEW YORK (Continued)

TONAWANDA IRON AND STEEL COMPANY.



GREY FORGE NIAGARA

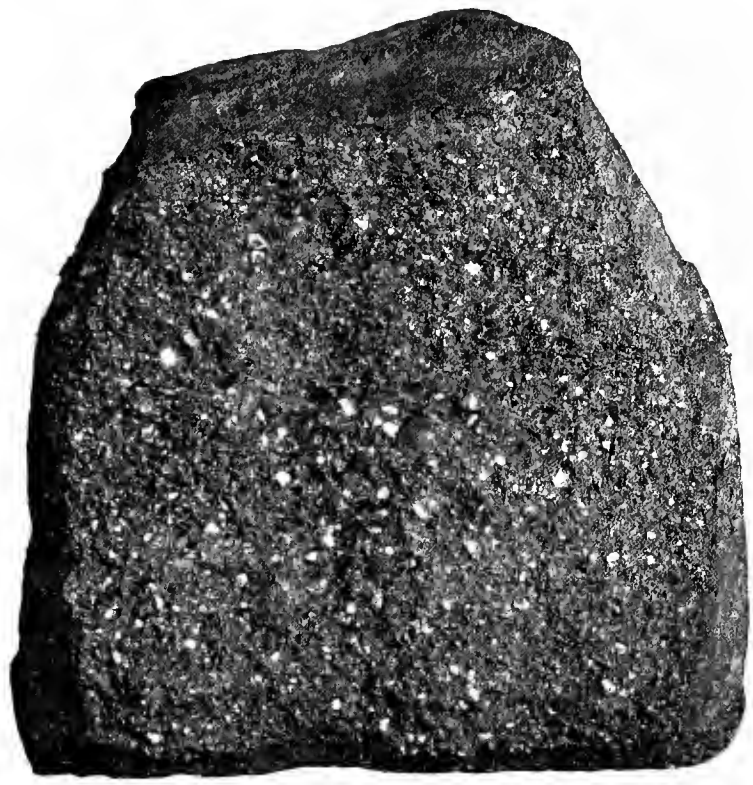
NEW YORK (Continued)

TONAWANDA IRON AND STEEL COMPANY.

No. 1 X TONAWANDA SCOTCH.

NEW YORK (Continued)

TONAWANDA IRON AND STEEL COMPANY.



No, 1 X NIAGARA PIG IRON.

NEW YORK (Continued)

TONAWANDA IRON AND STEEL COMPANY.

No. 2 X NIAGARA PIG IRON.

NEW YORK (Continued)

TROY STEEL COMPANY, THE—Breaker Island, Albany County. Stacks, 3. Total capacity 160,000 tons per year. Fuel, anthracite coal and coke. Ore, magnetic from Essex and Columbia Counties.

	Basic Bessemer.
Silicon	.50
Phosphorus	2.25
Sulphur	.03
Manganese	1.50

UNION IRON WORKS, Buffalo, Erie County. Stacks, 1. Capacity, 91,250 tons per year. Fuel, Walston or Connellsville coke. Ore, Lake Superior. Brand, "Union."

	No. 1.	No. 2 X.	No. 3.	Forge.	Malleable.	Bessemer.	Scotch.	No. 2 Plain.
Silicon	2.400	2.310	2.060	1.07	1.200	1.45	3.280	2.250
Phosphorus	.400	.410	.390	.70	.156	.09	410	.390
Sulphur	.013	.015	.020	.03	.030	.02	.008	.017
Manganese	.390	.380	.380	.35	.600	.80	.380	.390
Combined Carbon	.430	.490	.580	....	.720	...	400	.550
Graphitic Carbon	3.850	3.510	3.180	....	3 820	....	3.990	3.360

NORTH CAROLINA

CRANBERRY IRON AND COAL COMPANY, Cranberry, Mitchell County. Cranberry Furnace. Stacks, 1. Capacity, 5200 tons per year. Fuel, coke. Ore, magnetic. Brand, "Cranberry."

Could not obtain analysis of this iron.

EMPIRE STEEL AND IRON COMPANY, Greensboro, Guilford County. Cherokee. Furnace. Stacks, 1. Capacity, 35,000 tons per year. Fuel, Pocahontas coke. Ores, local magnetic and limonite. Brand, "Greensboro." ("Cherokee").

	No. 2 X.
Silicon	2.630
Phosphorus	.384
Sulphur	.062

OHIO

American Steel and Wire Company of New Jersey, Cleveland, Cuyahoga County. Emma Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Emma."

Could not obtain analysis of this iron.

American Steel and Wire Company of New Jersey, Cleveland, Cuyahoga County. Central and Newburgh Furnaces. Stacks, 3. Capacity, 230,000 tons per year. Fuel, coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

Andrews and Hitchcock Iron Company, The—Hubbard, Trumbull County. Hubbard Furnaces. Stacks, 2. Total capacity, 150,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Hubbard Scotch."

	No. 1.	No. 2.
Silicon	2.600	2.250
Phosphorus	.620	.620
Sulphur	.019	.022
Manganese	.660	.650
Combined Carbon	.150	.170
Graphitic Carbon	3.100	3.070

Belfont Iron Works Company, Ironton, Lawrence County. Belfont Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, coke. Ores, Lake Superior and native. Brand, "Belfont."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.
Silicon	2.500	2.250	1.95
Phosphorus	.450	.480	.49
Sulphur	.025	.018	.03
Manganese	.650	.750	.76
Combined Carbon	.160	.450	.45
Graphitic Carbon	3.450	3.150	3.10

Brier Hill Iron and Coal Company, Youngstown, Mahoning County. Grace Furnace No. 2. Stacks, 1. Capacity, 100,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Brier Hill."

	Average analysis.
Silicon	1.250
Phosphorus	.093
Sulphur	.022
Manganese	.750
Combined Carbon	.300
Graphitic Carbon	3.650

OHIO (Continued)

BROWN-BONNELL IRON COMPANY, THE—Youngstown, Mahoning County. Phœnix Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Phœnix."

Could not obtain analysis of this iron.

CAMPBELL IRON COMPANY, THE—Campbell, Lawrence County. Mount Vernon Furnace. Stacks, 1. Capacity, 3500 tons per year. Fuel, charcoal. Ore, native hematite. Brand, "Mt. Vernon."

	No. 1.	No. 2.	No. 3 or Cylinder.	No. 4.
Silicon	2.590	2.567	1.563	1.750
Phosphorus	.614	.684	.670	.684
Sulphur	.005	.005	.037	.085
Manganese	.775	.803	.726	.581
Combined Carbon	.060	.040	.160	.070
Graphitic Carbon	3.700	3.680	3.550	3.620

CENTRE MINING AND MANUFACTURING COMPANY, Ironton, Lawrence County. Centre Furnace. Stacks, 1. Capacity, 4500 tons per year. Fuel, charcoal. Ore, native limestone.

Could not obtain analysis of this iron.

CHERRY VALLEY IRON WORKS, Leetonia, Columbiana County. Cherry Valley Furnace. Stacks, 1. Capacity, 60,000 tons per year. Fuel, coke. Ores, Lake Superior and native mixed. Brand, "Cherry Valley."

Could not obtain analysis of this iron.

CLARE IRON COMPANY, Bloom Switch, Scioto County. Bloom Furnace. Stacks, 1. Capacity, 2700 tons per year. Fuel, charcoal. Ore, hematite. Brand, "Bloom."

Could not obtain analysis of this iron.

OHIO (Continued)

CORRIGAN, MCKINNEY AND COMPANY, Cleveland, Cuyahoga County. River Furnace. Stacks, 1. Capacity, 72,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brands, "River," "Douglas" and "Lincoln."

Could not obtain analysis of this iron.

GIRARD IRON COMPANY, Girard, Trumbull County. Mattie Furnace. Stacks, 1. Capacity, 100,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Girard."

	Bessemer.	Mill.
Silicon	1.250 to 1.750	1.000 to 2.000
Phosphorus	.088 to .100	.500 to .750
Sulphur	.015 to .040	.025 to .060
Manganese	.500 to .800	400 to .800

GLOBE IRON COMPANY, Jackson, Jackson County. Fulton Furnace. Stacks, 1. Capacity, 7500 tons per year. Fuel, coal and coke. Ore, native. Brand, "Globe."

	High Silicon.
Silicon	10.440
Phosphorus	.660
Sulphur	Trace
Manganese	.630

HECLA IRON AND MINING COMPANY, near Ironton, Lawrence County. Hecla Furnace. Stacks, 1. Capacity, 9000 tons per year. Fuel, charcoal and coke. Ores, Lake Superior and Hanging Rock limestone. Brand, "Hecla."

	No. 2.	No. 3.	No. 4.
Silicon	.610	51	58
Manganese	389	.38	.32
Combined Carbon	460	43	49
Graphitic Carbon	3.890	3.61	3 42

OHIO (Continued)

JEFFERSON IRON COMPANY, Oak Hill, Jackson County. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ore, native. Brand "Anchor."

Could not obtain analysis of this iron.

LAWRENCE FURNACE COMPANY, Culbertson, Lawrence County. Lawrence Furnace. Stacks, 1. Capacity, 10,000 tons per year. Fuel, coal and coke. Ores, native and Bath County, Ky. Brands, "Lawrence" and "Pencost."

	X.	XX.
Silicon	8.030	12.00
Phosphorus	.128	.12
Sulphur	.030	Trace
Manganese	420	.40
Combined Carbon	240	.22
Graphitic Carbon	4.000	5.10

LORAIN STEEL COMPANY, THE—Lorain, Lorain County. Stacks, 2. Total capacity, 350,000 tons per year. Fuel, Connellsville coke. Ores, Lake Superior and Mesabi. Brand, "Lorain."

This company makes but one grade, Standard Bessemer Pig Iron, and that only for their own consumption.

MARTING IRON AND STEEL COMPANY, THE—Irontou, Lawrence County. Alice and Blanche Furnaces. Stacks, 2. Total capacity, 30,000 tons per year. Fuel, Pocahontas coke. Ores, Hanging Rock, Lake Superior, Virginia and Kentucky.

	Standard Bessemer.
Silicon	2.220
Phosphorus	.089
Sulphur	.008

MCGUGIN AND COMPANY, Olive Furnace P. O., Lawrence County. Olive Furnace. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ore, native limestone. Brand, "Olive."

	No. 2.
Silicon	3.170
Phosphorus	.668
Sulphur	.080
Manganese	.980
Combined Carbon	.290
Graphitic Carbon	3.280

OHIO (Continued)

MEANS, KYLE AND COMPANY, Hanging Rock, Lawrence County. Hamilton Furnace. Stacks, 1. Capacity, 25,000 tons per year. Fuel, Pocahontas coke. Ores, native and Lake Superior. Brand, "Hamilton."

	No. 1.	No. 2.	No. 3.
Silicon	2.800	2.250	1.750
Phosphorus	.450	.450	.450
Sulphur	.015	.030	.050
Manganese	.600	.600	.600
Combined Carbon	.200 to .400	.200 to .400	.200 to .400
Graphitic Carbon	3.500 to 3.800	3.500 to 3.800	3.500 to 3.800

NATIONAL STEEL COMPANY, Columbus Works, Columbus, Franklin County. Stacks, 2. Total capacity, 210,000 tons per year. Fuel, coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

NATIONAL STEEL COMPANY, Aetna-Standard Works, Mingo Junction, Jefferson County. Mingo Furnaces. Stacks, 2. Total capacity, 165,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

	Bessemer
Silicon	1.000 to 2.50
Phosphorus	.080 to .10
Sulphur	.015 and up.
Manganese	.500 and up.

NATIONAL STEEL COMPANY, Zanesville Works, Zanesville, Muskingum County. Stacks, 1. Capacity, 65,000 tons per year. Fuel, coke. Ore, Lake Superior.

	Standard Bessemer.
Silicon	1.25 to 2 00
Phosphorus.	.10 and below.
Sulphur	.05 and below.

NATIONAL STEEL COMPANY, THE—Niles Works, Niles, Trumbull County. Stacks, 1. Capacity, 100,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

OHIO (Continued)

NATIONAL STEEL COMPANY, Bellaire Works, Bellaire, Belmont County. Bellaire Furnaces. Stacks, 2. Total capacity, 160,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

	Bessemer.
Silicon	1.00 to 2.00
Phosphorus	under .10
Sulphur	under .05
Manganese	.50 to .75

NATIONAL STEEL COMPANY, Steubenville Works, Steubenville, Jefferson County. Jefferson Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Make only Bessemer Pig Iron for their own consumption.

NATIONAL TUBE COMPANY, Steubenville, Jefferson County. Steubenville Furnace. Stacks, 1. Capacity, 75,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Riverside."

Could not obtain analysis of this iron.

OHIO IRON AND STEEL COMPANY, THE—Lowellville, Mahoning County. Mary Furnace. Stacks, 1. Capacity, 100,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Mary Ohio Scotch."

	No. 1.
Silicon	3.150
Phosphorus	.425
Sulphur	.018
Manganese	1.200
Combined Carbon	.250
Graphitic Carbon	2.970

OHIO MINING AND MANUFACTURING COMPANY, THE—(leased to Miller, Wagoner and Fieser Company), Shawnee, Perry County. New York Furnaces. Stacks, 2. Total capacity, 45,000 tons per year. Fuel, coal and coke. Ores, native and Lake Superior.

Could not obtain analysis of this iron.

PENN-IRON AND COAL COMPANY, THE—Canal Dover, Tuscarawas County. Dover Furnace. Stacks, 1. Capacity, 100,000 tons per year. Fuel, coke. Ores, native and Lake Superior. Brands, "Tuscarawas" and "Dover."

	Standard Bessemer.
Silicon	1.00 to 2.500
Phosphorus	below .100
Sulphur	below .050
Manganese	below .500

OHIO (Continued)

REPUBLIC IRON AND STEEL COMPANY, Youngstown, Mahoning County. Hannah Furnace. Stacks, 1. Capacity, 65,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

REPUBLIC IRON AND STEEL COMPANY, Youngstown, Mahoning County. Haselton Furnace. Stacks, 1. Capacity, 120,000 tons per year. Fuel, coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

SALEM IRON COMPANY, THE—Leetonia, Columbiana County. Seneca Furnace. Stacks, 1. Capacity, 90,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brands, "Seneca" and "Grafton."

	Seneca.	Grafton.
Silicon	1.00 to 2.00	2.00 to 3.00
Phosphorus.	.09 to .18	40 to .80
Sulphur	.02 to .06	.01 to .06
Manganese	.50 to .80	.60 to .90

SARAH FURNACE, Ironton, Lawrence County. Stacks, 1. Capacity, 40,000 tons per year. Fuel, West Virginia coke. Ore, Lake Superior. Brand, "Sarah."

	Bessemer.
Silicon	.350 to 4.000
Phosphorus.	.080
Sulphur	.008
Manganese	400
Graphitic Carbon	4.000

STAR FURNACE COMPANY, Jackson, Jackson County. Star Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, coke. Ore, native Brand, "Star."

	Foundry.	Bessemer Ferro-Silicon.
Silicon	8.000 to 12.000	10.000 to 16.000
Phosphorus.	450 to 1.500	.025 to .100
Sulphur	.010 to .025	.010 to .050
Manganese	.800 to 1.000	.150 to .250
Total Carbon	2.200 to 2.300	1.500 to 2.300

STRUTHERS FURNACE COMPANY, THE—Struthers, Mahoning County. Anna Furnace. Stacks, 1. Capacity, 90,000 tons per year. Fuel, coke. Ore, Lake Superior.

	Bessemer.	Basic.
Silicon	1.300	.800
Phosphorus.	.095	.450
Sulphur	.025	.030
Manganese	.500	.600
Combined Carbon	.650	.750
Graphitic Carbon	3 100	3.060

OHIO (Continued)

VESUVIUS IRON COMPANY, Pedro, Lawrence County. Vesuvius Furnace. Stacks, 1. Capacity, 3000 tons per year. Fuel, charcoal (cold blast). Ore, native limestone. Brand, "Vesuvius."

	No. 1.	No. 2.
Silicon	.75	.70
Phosphorus	.26	.36
Sulphur	.02	.02
Manganese	.49	.39
Combined Carbon	.95	.57
Graphitic Carbon	3.13	3.08

WELLSTON IRON AND STEEL COMPANY, Wellston, Jackson County. Wellston Furnaces, 2; Milton Furnace, 1; Madison Furnace, 1. Total stacks, 4. Total capacity, 65,000 tons per year. Fuel, coke. Ores, local and Lake Superior.

	No. 4 to No. 7 Car Wheel.	Neutral Car Wheel.	Strong, Soft Foundry.	Malleable.	Ohio Scotch.	Wellston.
Silicon	.50 to .80	1.50 to 2.50	1.000 to 3.000	.750 to 2.500	2.50 to 4.50	6.000 to 12.000
Phosphorus	.12 to .13	.50 to .60	.200 to 400	.130 to .140	.60 to .90	.600 to .900
Sulphur	.09 to .03	.05 to .01	.050 to .009	.050 to .009	.05 to 03	.040 to .003
Manganese	.90 to 1.25	40 to .50	.600 to 900	.600 to 1.250	.30 to .50	.300 to .500
Total Carbon	3.00 to 3.25	2 75 to 3.25	3 000 to 3.250	3.000 to 3.250	2 75 to 3.00	2.500 to 2 750
Graphitic Carbon	2.00 to 2.25	2.30 to 2.75	2.700 to 2.900	2.300 to 2.600	2.40 to 2.75	2.200 to 2.500

WHEELING STEEL AND IRON COMPANY, Martin's Ferry, Belmont County. Martin's Ferry Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Standard Bessemer.

Silicon	1.50 to 2.50
Phosphorus	Not to exceed .10
Sulphur	" " .05

YOUNGSTOWN STEEL COMPANY, THE—Youngstown, Mahoning County. Tod Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Washed Metal.

Silicon	none
Phosphorus	.010
Sulphur	.015
Manganese	none
Combined Carbon	3.500
Graphitic Carbon	none

OREGON

OREGON IRON AND STEEL COMPANY, Oswego, Clackamas County. Oswego Furnace. Stacks, 1. Capacity, 15,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Oregon."

Could not obtain analysis of this iron.

PENNSYLVANIA

ALLENTOWN IRON WORKS, Allentown, Lehigh County. Stacks, 2. Total capacity, 60,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetic, Lake Superior and local hematite. Brand, "Allentown."

	Foundry.	Low Phosphorus.
Silicon	2.50	1.750
Phosphorus	1.00	.025
Sulphur	.04	.014
Manganese	.37	.560
Combined Carbon	.17	.080
Graphitic Carbon	3.45	3.600

AMERICAN STEEL HOOP COMPANY, formerly operated by The Isabella Furnace Company, Inc. Etna. Isabella Furnaces. Stacks, 3. Total capacity, 215,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Isabella."

	Average analysis.
Silicon	1.50 to 4.00
Phosphorus	40 to .70
Sulphur	.03 to .05
Manganese	70 to 1.00

AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, Allegheny Works, Allegheny City. Edith Furnace. Stacks, 1. Capacity, 75,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Edith."

Could not obtain analysis of this iron.

AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, Pittsburgh. Shoenberger Furnaces. Stacks, 2. Total capacity, 130,000 tons per year. Fuel, coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

PENNSYLVANIA (Continued)

AMERICAN STEEL HOOP COMPANY, West Middlesex, Mercer County. Fannie Furnace. Stacks, 1. Capacity, 36,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Wheeler."

Could not obtain analysis of this iron.

ATLANTIC IRON AND STEEL COMPANY, Newcastle, Lawrence County. Atlantic Furnaces. Stacks, 2. Total capacity, 72,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Etna."

	Bessemer.
Silicon	1.00 to 2.50
Phosphorus	.10 and under
Sulphur	.05 and under

BELLEFONTE FURNACE COMPANY, Bellefonte, Centre County. Bellefonte Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, native hematite. Brand, "Bellefonte."

	Average analysis.
Silicon	1.50 to 4.00
Phosphorus	40 to .70
Sulphur	below .04
Manganese	.40 to .60
Combined Carbon	.25 to .65
Graphitic Carbon	2.50 to 3.25

BERLIN IRON WORKS, Gleniron, Union County. Stacks, 1. Capacity, 2500 tons per year. Fuel, charcoal (cold blast). Ores, hematite and fossil.

	Average analysis.
Silicon	.690
Phosphorus	.236
Sulphur	.033
Manganese	.294
Combined Carbon	.926
Graphitic Carbon	2.741

BETHLEHEM STEEL COMPANY, South Bethlehem, Northampton County. Stacks, 5. Total capacity, 225,000 tons per year. Fuel, anthracite coal and coke Ores, local and foreign hematite and magnetic.

	Low Phosphorus Bessemer.	Ordinary Bessemer.	Basic.
Silicon	.750 to 2.000	1.000 to 2.000	.500 to 1.500
Phosphorus	.025 to .040	.065 to .075	750 to .900
Sulphur	.010 to .040	.030 to .080	.020 to .050

PENNSYLVANIA (Continued)

Boiling Springs Iron Company, Boiling Springs, Cumberland County. Stacks, 1. Capacity, 3000 tons per year. Fuel, charcoal (cold blast). Ore, foreign as a basis. Brand, "Boiling Springs."

Could not obtain analysis of this iron.

Bonbrake, Burkhart and Company, Chambersburg, Franklin County. Falling Spring Furnace. Stacks, 1. Capacity, 3000 tons per year. Fuel, charcoal. Ore, local hematite. Brand, "Falling Spring."

Could not obtain analysis of this iron.

Brooke Iron Company, E. & G.—Birdsboro, Berks County. Keystone Furnaces. Stacks, 2. Total capacity, 63,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetic and hematite. Brand, "Brooke."

Could not obtain analysis of this iron.

Cambria Steel Company, Johnstown, Cambria County. Stacks, 6. Total capacity, 480,000 tons per year. Fuel, Connellsville coke. Ores, Menominee and Mesabi hematite and native and foreign manganiferous.

Could not obtain analysis of this iron.

Carbon Iron and Steel Company, Ltd., Parryville, Carbon County. Stacks, 1. Capacity, 38,000 tons per year. Fuel, anthracite coal and coke. Ores, hematite, magnetic, Lake Superior and foreign. Brands, "Carbon," "Parry" and "Viking."

	Average analysis. Nos. 1 X and 2 X.
Silicon	1.800 to 3.500
Phosphorus	.800 to 1.000
Sulphur	.015 to .040
Manganese	.350 to .700
Combined Carbon	.250 to .750
Graphitic Carbon	2.750 to 4.000

PENNSYLVANIA (Continued)

CARNEGIE STEEL COMPANY, LTD., THE—Allegheny County. Stacks, 17. Total capacity, 2,200,000 tons per year. Fuel, Connellsville coke. Ores, Pennsylvania, Lake Superior and foreign.

	Average analysis. Bessemer.	Mill.
Silicon	1.250	.50
Phosphorus	.085	.30
Sulphur	.025	.04
Manganese	.600	1.25
Combined Carbon. } Graphitic Carbon }	4.200	4.00

Analysis of iron made by Carrie Furnaces, included in the 17 stacks above mentioned.

	Special Bessemer.	Bessemer.	Foundry.	Basic Open Hearth.
Silicon	1.300	1.250	1.750	.500
Phosphorus	.028	.090	.600	.520
Sulphur	.020	.030	.035	.040
Manganese	.500	.500	.600	1.200
Combined Carbon	....	....	....	.750
Graphitic Carbon	....	....	....	3.000

CHESTNUT GROVE FURNACE, Idaville, Adams County. Stacks, 1. Capacity, 1500 tons per year. Fuel, charcoal (cold blast). Ores, local magnetite and hematite. Brand, "Chestnut Grove C. B."

Could not obtain analysis of this iron.

CHICKIES IRON COMPANY, LTD., THE—Chickies, Laucaster County. Chickies Furnaces. Stacks, 2. Total capacity, 33,500 tons per year. Fuel, anthracite coal and coke. Ore, magnetic from Cornwall, Lebanon County. Brand, "Chickies."

	Bessemer.
Silicon	1.000 to 2.000
Phosphorus	.045 to .055
Sulphur	.010 to .030
Manganese	.150 to .250

PENNSYLVANIA (Continued)

CLAIRE FURNACE COMPANY, LTD., Sharpsville, Mercer County. Claire Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, coke. Ore, Lake Superior.

	Average analysis.
Silicon	1.250
Phosphorus	.093
Sulphur	.020
Manganese	.700
Combined Carbon	.710
Graphitic Carbon	3.390

CLINTON IRON AND STEEL COMPANY, Pittsburgh. Clinton Furnace. Stacks, 1. Capacity, 63,500 tons per year. Fuel, coke. Ore, Lake Superior. Brands, "Hector" and "Clinton."

	A X.	A.	B.
Silicon	2.750	2.250 to 2.500	1.800 to 2.250
Phosphorus	.750	.600	.600
Sulphur	.005	.010 to .020	.020 to .035
Manganese	.500	.600	.600
Combined Carbon	.100	.200	.250 to .400
Graphitic Carbon	3.500	3.250	3.000 to 3.250

CORRIGAN, MCKINNEY AND COMPANY, lessees. Scottdale, Westmoreland County. Charlotte Furnace. Stacks, 1. Capacity, 70,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Charlotte."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Grey Forge.
Silicon	1.750	1.600	1.350	1.250
Phosphorus	.678	.650	.612	.776
Sulphur	.018	.025	035	.050
Manganese	.600	.680	780	.830
Combined Carbon	.360	400	440	460
Graphitic Carbon	3.580	3.410	3.310	3.170

CORRIGAN, MCKINNEY AND COMPANY, lessees, Sharpsville, Mercer County. Douglas Furnaces. Stacks, 2. Total capacity, 45,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Douglas."

	Average analysis.
Silicon	1.250
Phosphorus	.095
Sulphur	.025
Manganese	.800

PENNSYLVANIA (Continued)

COLONIAL IRON COMPANY (successors to Kemble Iron Company), Riddlesburg, Bedford County. Kemble Furnaces. Stacks, 2. Total capacity, 30,000 tons per year. Fuel, coke. Ore, Lake Superior hematite. Brand, "Kemble."

	Average analysis.
Silicon	1.000 to 3.00
Phosphorus	.650
Sulphur	.025
Combined Carbon	.180
Graphitic Carbon	3.500

COLERAINE IRON WORKS, Redington, Northampton County. Stacks, 2. Total capacity, 40,000 tons per year. Fuel, anthracite coal. Ores, hematite and magnetic. Brand, "Coleraine."

Could not obtain analysis of this iron.

DUNBAR FURNACE COMPANY, Dunbar, Fayette County. Dunbar Furnaces. Stacks, 2. Total capacity, 100,000 tons per year. Fuel, coke. Ores, native, Lake Superior Bessemer, and specular. Brand, "Dunbar."

	No. 1 Foundry.	No. 2 Foundry.	Grey Forge.	Basic.
Silicon	2.000 to 2.500	1.500 to 2.000	.750 to 1.500	.200 to 1.000
Phosphorus	.200 to .400	.200 to .400	.200 to .400	.200 to 450
Sulphur	.005 to .030	.010 to .035	.025 to .050	.020 to .050
Manganese	.300 to .650	.300 to .650	.300 to .650	.300 to .650
Combined Carbon	.150 to .320	.250 to 450	.400 to .800	.600 to 1.250
Graphitic Carbon	3.500 to 4.000	3.250 to 3.750	2.250 to 3.000	1.750 to 2.500

DURHAM IRON WORKS, Riegelsville, Bucks County. Durham Furnace. Stacks, 1. Capacity, 38,000 tons per year. Fuel, anthracite coal and coke. Ores, hematite, magnetic and foreign. Brand, "Durham."

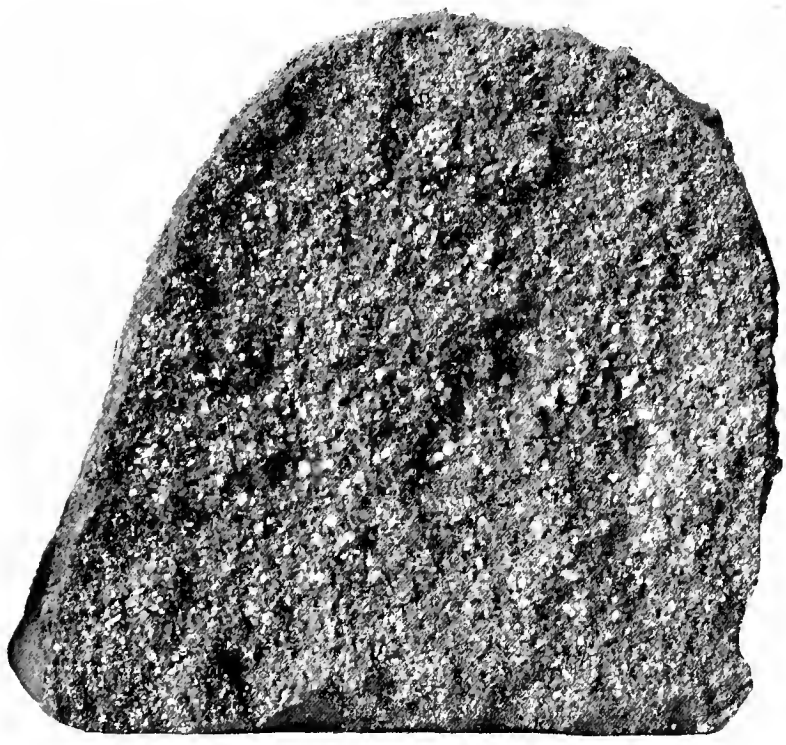
	Foundry.	Mill.
Silicon	1.50 to 3.00	.50 to 1.50
Phosphorus	.50 to .70	.50 to .70
Sulphur	.01 to .03	.01 to .06

EMPIRE STEEL AND IRON COMPANY, Catasaqua, Lehigh County. Crane Furnaces. Stacks, 4. Total capacity, 135,000 tons per year. Fuel, anthracite coal and coke. Ores, Lake Superior, Port Henry and Chataguay. Brands, "Crane" and "Crane L. P."

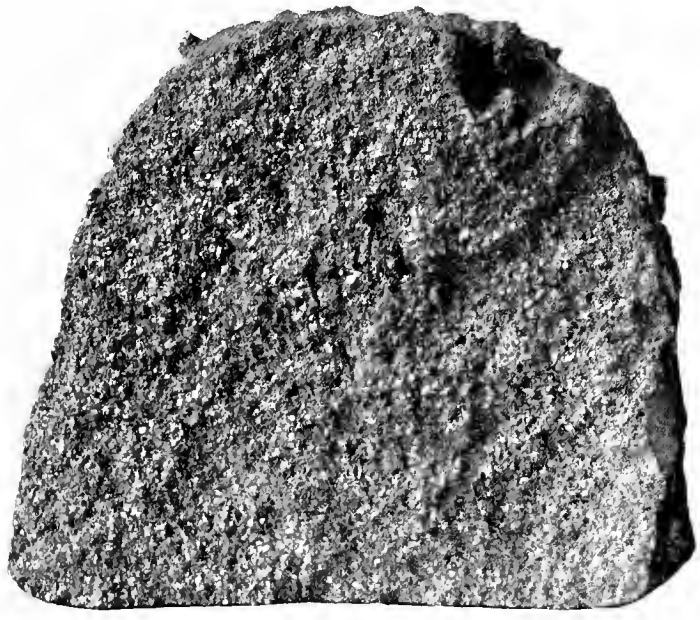
	No. 1 X.	No. 2 X.	No. 2 Plain.	Crane Scotch.	Bessemer.
Silicon	2.722	2.386	2.100	3.500	1.450
Phosphorus	.793	.790	.800	.900	.019
Sulphur	.015	.021	.035	.015	.015
Manganese	.360	.380	.380	.400	.135
Combined Carbon	.150	.200	.280	.100	.600
Graphitic Carbon	3.550	3.400	3.000	3.100	3.600

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



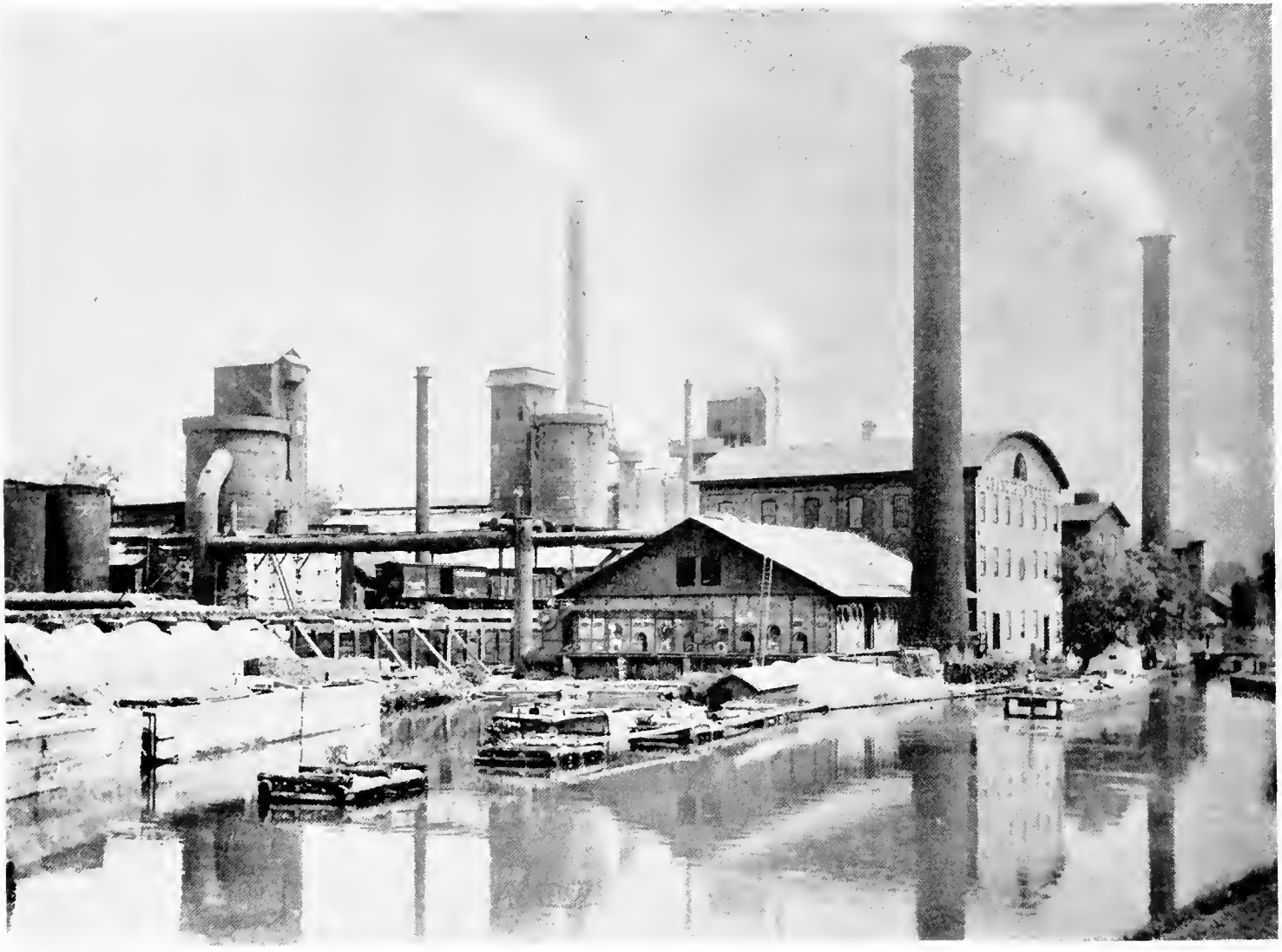
NO. 1 X CRANE.



NO. 2 X CRANE.

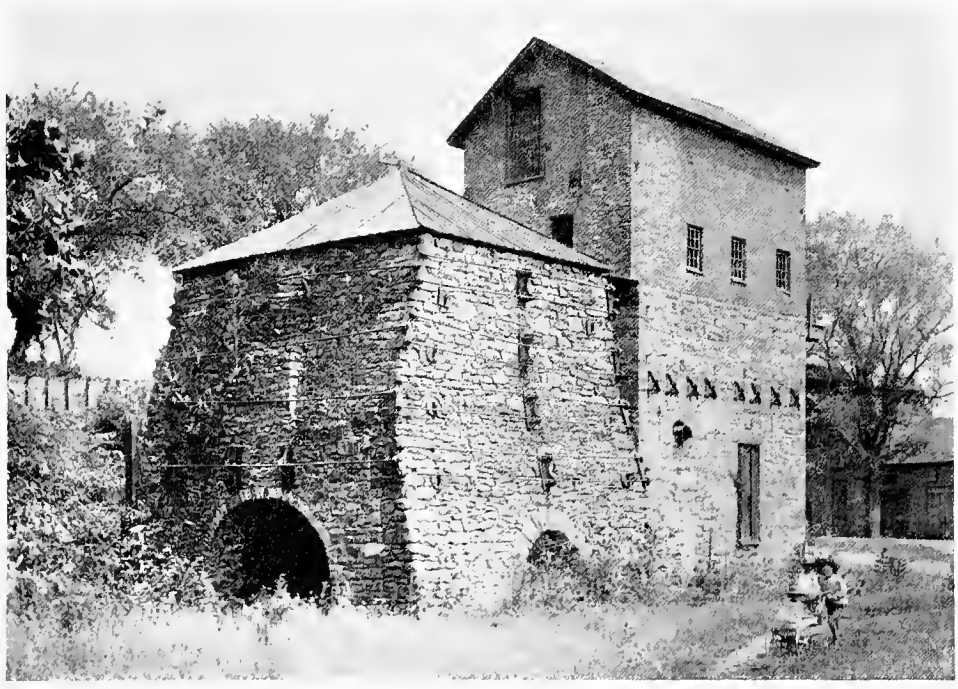
PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



LEHIGH CANAL AND GENERAL VIEW OF CRANE IRON WORKS.

PENNSYLVANIA (Continued)

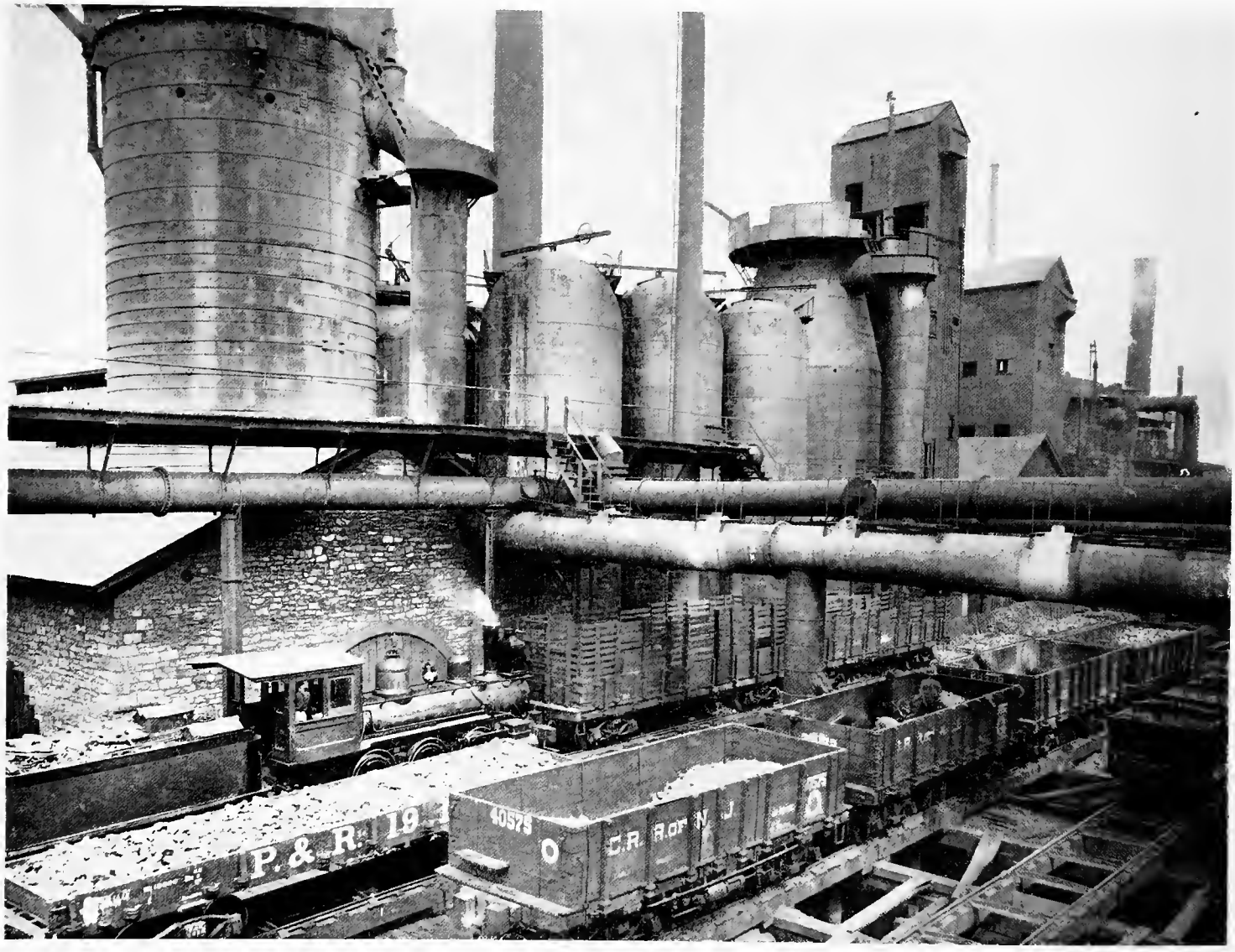


OLD CHARCOAL FURNACE, 1742 (OXFORD VIEW).

(For view of up-to-date furnace see page 86.)

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



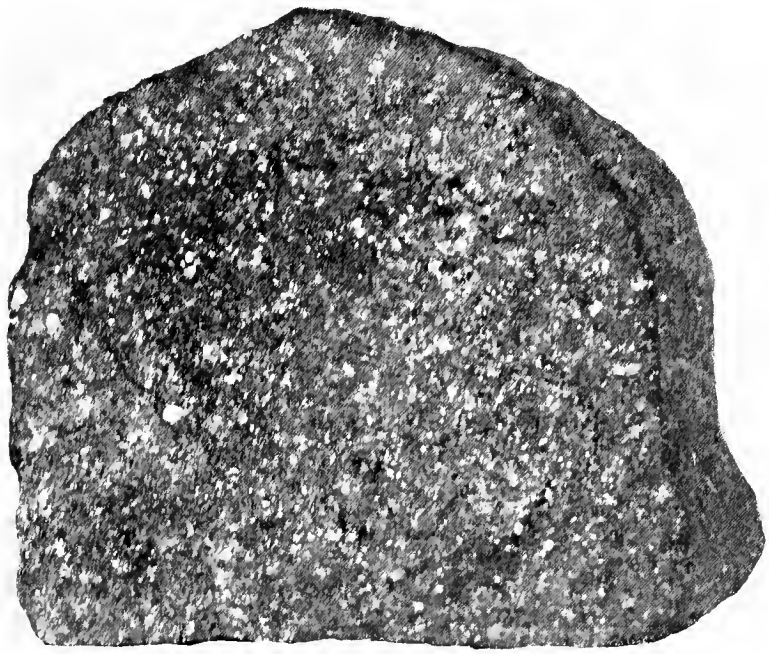
CRANE IRON WORKS, SHOWING UNLOADING OF ORE.

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY, Reading, Berks County. Henry Clay Furnaces. Stacks, 2. Total capacity, 36,000 tons per year. Fuel, anthracite coal and coke. Ore, very rich fossil. Brand, "Henry Clay."

Average of Different Grades.

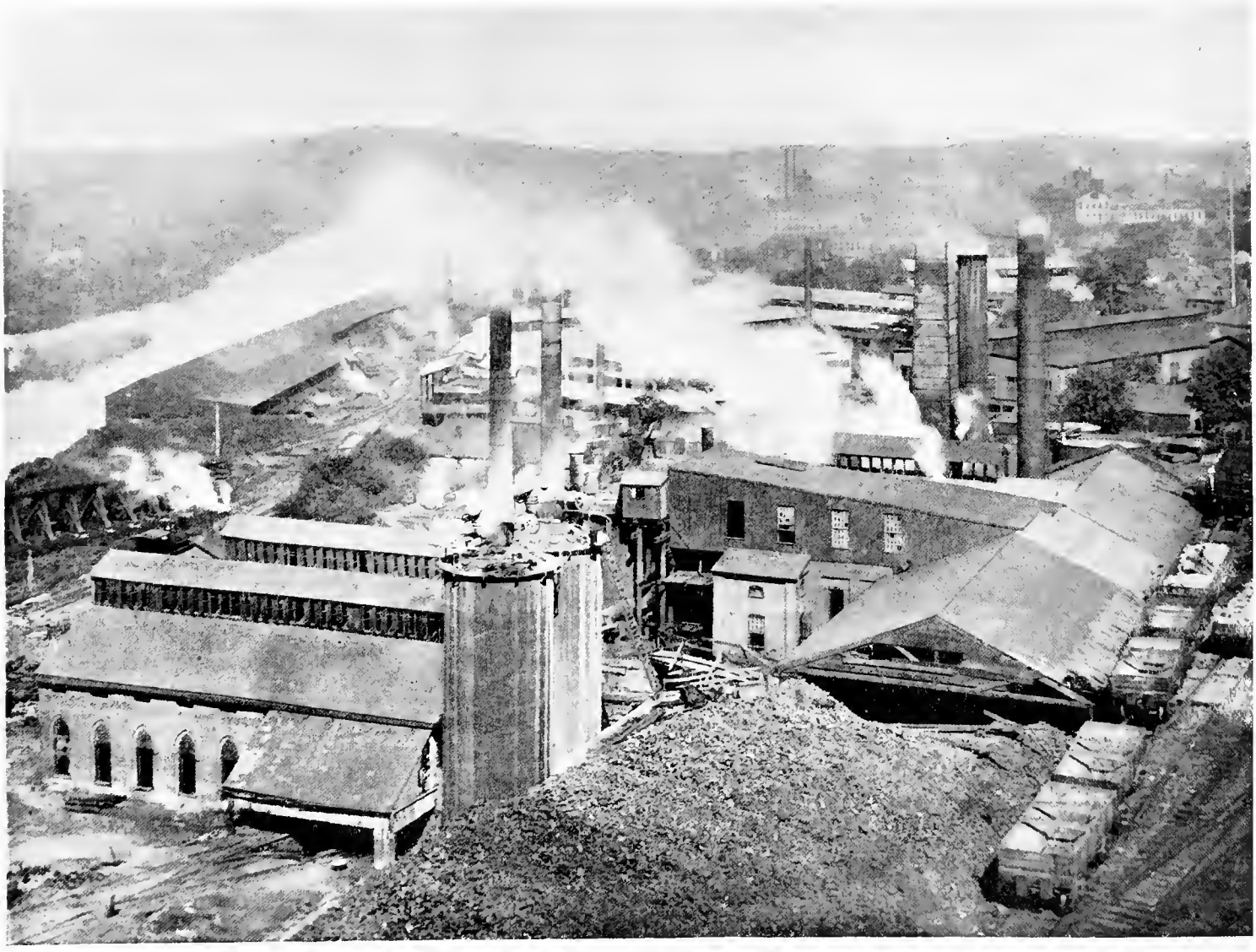
Silicon	2.25 to 4.50
Phosphorus	2.50 to 4.00
Sulphur	.02 to .06
Manganese	....
Combined Carbon	.10 to .20
Graphitic Carbon	2.50 to 3.00



CARBONIZED HENRY CLAY.

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



HENRY CLAY FURNACES, READING, PA.
(General View.)

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY, Macungie, Lehigh County. Macungie Furnace. Stacks, 1. Capacity, 20,000 tons per year. Fuel, anthracite coal and Connellsville coke. Ore, native hematite. Brand, "Macungie."

	No. 1.	No. 2.	No. 3.	Grey Forge.	Standard Bessemer.
Silicon	3.00	2.75	2.25	1.250	1.00 to 2.00
Phosphorus	.90	.90	.90	.900	10 or under.
Sulphur	.01	.02	.04	.056	.05 or under.
Manganese	.55	.55	.55	.550	
Combined Carbon	.14	.19	.30	.480	
Graphitic Carbon	3.50	3.21	2.97	2.840	

EMPIRE STEEL AND IRON COMPANY, Topton, Berks County. Topton Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, anthracite coal and coke. Ore, Lake Superior. Brand, "Topton."

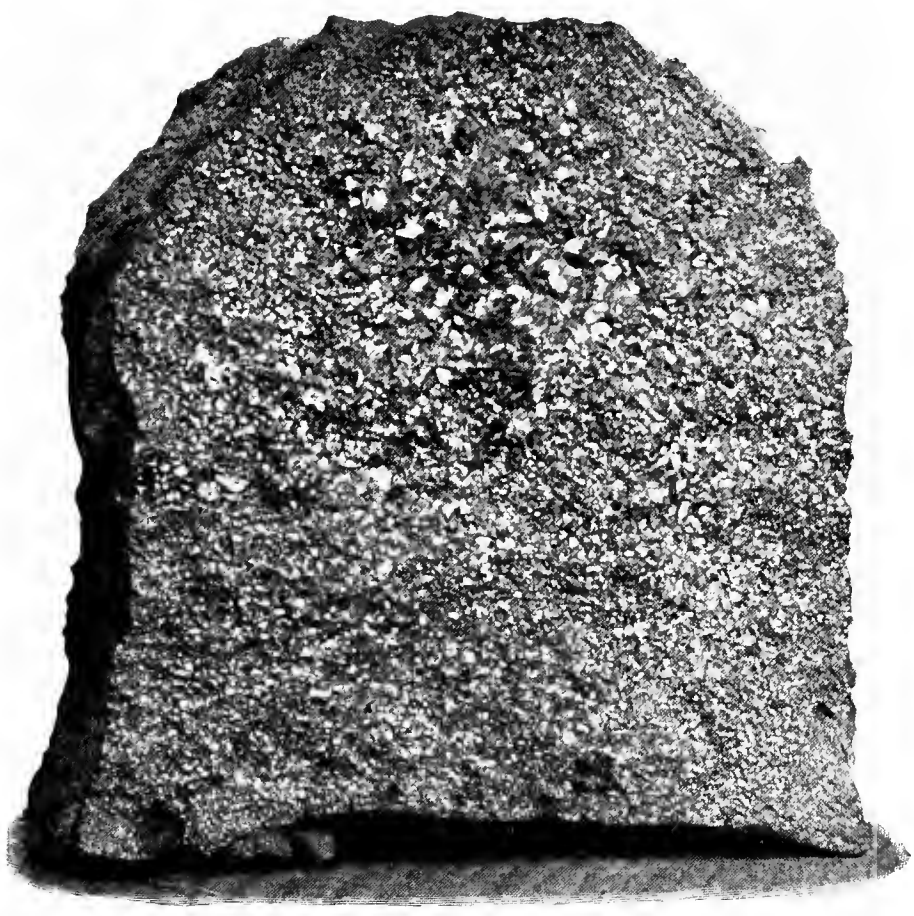
	No. 1 X.	No. 2 X.	No. 2 Plain.
Silicon	3.000	2.800	2.300
Phosphorus	1.000	1.000	1.050
Sulphur	.030	.033	.040
Manganese	.290	.300	
Combined Carbon	.300		
Graphitic Carbon	3.350		

EMPIRE STEEL AND IRON COMPANY, Bellefonte, Centre County. Valentine Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, Connellsville coke. Ores, Lake Superior and native brown. Brand, "Nittany."

	No. 1.	No. 2.	No. 3.	Grey Forge.
Silicon	3.250	2.750	2.250	1.500
Phosphorus	.500	.500	.500	.500
Sulphur	.007	.015	.025	.060
Manganese	.420	.420	.420	.420
Combined Carbon	.150	.180	.350	.580
Graphitic Carbon	3.460	3.320	2.910	2.750

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



No. 1 X NITTANY.

PENNSYLVANIA (Continued)

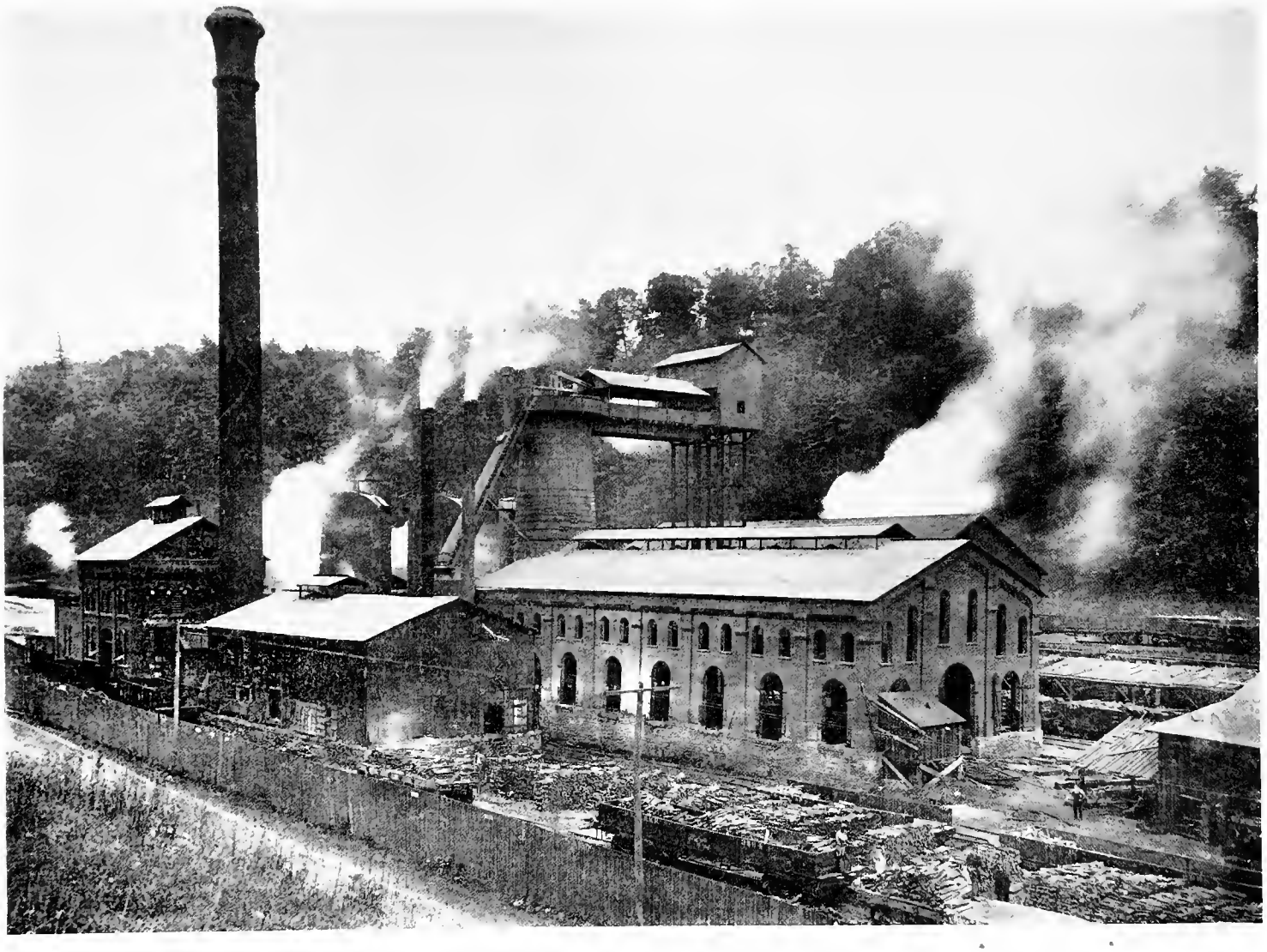
EMPIRE STEEL AND IRON COMPANY.

VALENTINE FURNACE, BELLEFONTE, PA.

Loading Famous Nittany Iron.

PENNSYLVANIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



NITTANY FURNACE, BELLEFONTE, PA.

PENNSYLVANIA (Continued)

EMPORIUM FURNACE COMPANY, Emporium, Cameron County. Emporium Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, coke. Ores, Old Sterling and Lake Superior. Brand, "Emporium."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 Foundry.	Grey Forge.	Scotch.	Silvery.
Silicon	3.000	2.750	2.500	2.250	1.400	4.000	5.500
Phosphorus	.900	.900	.900	.900	.900	.900	.900
Sulphur	.030	.040	.050	.060	.080	.040	.040
Manganese	700	.700	.700	700	.700	.700	700
Combined Carbon	.220	.300	.600	750	.900	.150	.200
Graphitic Carbon	3.750	3.600	3.250	3.000	2 750	3.500	3.400

EVERETT FURNACE, Everett, Bedford County. Stacks, 1. Capacity, 65,000 tons per year. Fuel, coke. Ores, Juniata fossil and hematite and Lake Superior hematite. Brands, "Everett Scotch," "Everett Strong Foundry," "Everett Mill," "Everett Basic," and "Everett Bessemer."

	Foundry Average analysis.
Silicon	1.500 to 4.500
Phosphorus	.300 to .700
Sulphur	.010 to .045
Manganese	.200 to .700
Combined Carbon	.200 to .600
Graphitic Carbon	3.000 to 3.750

HECKSCHER AND SONS COMPANY, R.—Swedeland, Montgomery County. Swede Furnaces. Stacks, 2. Total capacity, 90,000 tons per year. Fuel, anthracite coal and coke. Ores, Lake Superior specular, New Jersey magnetic and foreign. Brand, "Swede."

Could not obtain analysis of this iron.

JEFFERSON FURNACE, Jefferson Station, Schuylkill County. Stacks, 1. Capacity, 2300 tons per year. Fuel, charcoal (cold blast). Ore, hematite from Berks and Lehigh Counties.

Could not obtain analysis of this iron.

JONES AND LAUGHLIN, LTD., Pittsburgh. Eliza Furnaces. Stacks, 4. Total capacity, 350,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Eliza."

	Bessemer.
Silicon	1.100
Phosphorus	.088
Sulphur	.020 to .035
Manganese	.400

PENNSYLVANIA (Continued)

JOANNA FURNACE, Berks County. Stacks, 1. Capacity, 1500 tons per year. Fuel, charcoal. Ores, local magnetite and hematite. Brand, "Joanna."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	1.75 to 2.00	1.00 to 1.75	.75	.50
Phosphorus	.50	.50	.50	.50
Sulphur	.03	.03	.03	05
Manganese	.50	....	....	....
Total Carbon	4 10	....	...	....

JUNIATA FURNACE AND FOUNDRY COMPANY, Newport, Perry County. Juniata Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, anthracite coal and coke. Ores, silicious, native, fossil and brown hematite. Brand, "Marshall."

	Foundry High Silicon.
Silicon	3.250
Phosphorus	700
Sulphur	.045
Manganese	.500
Combined Carbon	.100
Graphitic Carbon	3.150

KITTANNING IRON AND STEEL MANUFACTURING COMPANY, Kittanning, Armstrong County. Rebecca Furnace. Stacks, 1. Capacity, 55,000 tons per year. Fuel, Connellsville coke. Ores, native and Lake Superior. Brands, "Kittanning" and "Rebecca."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Open Forge.	Close Forge.	Mottled.	Silvery.	White Iron.
Silicon	2.25 to 3.25	2.00 to 3.00	1.75 to 2.50	1.50 to 2.25	1.25 to 2.00	.75 to 1.25	3.00 to 4.50	.30 to 1.00
Phosphorus	.25 to .75	.25 to .75	.30 to .80	.30 to .80	.30 to .80	.30 to .80	.30 to .60	.30 to .85
Sulphur	.01 to .04	.01 to .05	.02 to .06	.02 to .06	.03 to .08	.04 to .10	.01 to .03	.08 to .20
Manganese	.35 to 1.00	.35 to 1.00	.35 to 1.00	.35 to 1.00	.30 to .90	.30 to .90	.40 to 1.00	.30 to .70
Combined Carbon	.20 to .80	.40 to 1.00	.50 to 1.00	.75 to 1.25	1.00 to 1.50	1.50 to 2.00	.10 to .60	High
Graphitic Carbon	3.00 to 3.60	2.75 to 3 30	2.50 to 3.00	2.30 to 2.80	2.00 to 2.50	1.50 to 2.00	3.00 to 4.00	Very Low

LACKAWANNA IRON AND STEEL COMPANY, Scranton, Lackawanna County. Lackawanna Furnaces. Stacks, 9. Total capacity, 450,000 tons per year. Fuel, anthracite coal and coke. Ores, Cornwall magnetic from Lake Champlain and Putnam County, N. Y., and some Lake Superior. Brand, "Lackawanna."

Could not obtain analysis of this iron.

PENNSYLVANIA (Continued)

LEBANON VALLEY FURNACE (J. and R. Meily), Lebanon, Lebanon County. Stacks, 1. Capacity, 20,000 tons per year. Fuel, anthracite coal and coke. Ore, principally Cornwall. Brand, "Lebanon Valley."

	Foundry.
Silicon	4.740
Phosphorus	.384
Sulphur	.029

LEBANON FURNACES, Lebanon, Lebanon County. Stacks, 2. Total capacity, 80,000 tons per year. Fuel, anthracite coal and coke. Ore, Cornwall.

Silicon	1.50 to 3.50
Phosphorus	.03 to .06
Sulphur	.02 to .08
Manganese	.20
Combined Carbon	.20 to 1.00
Graphitic Carbon	1.25 to 3.25

LEESPORT IRON COMPANY, Leesport, Berks County. Leesport Furnace. Stacks, 1. Capacity, 18,000 tons per year. Fuel, anthracite coal. Ores, local hematite and magnetic. Brand, "Leesport."

Could not obtain analysis of this iron.

LEHIGH ZINC AND IRON COMPANY, South Bethlehem, Northampton County. Stacks, 1. Capacity, 5400 tons per year. Fuel, anthracite coal and coke. Brand, "Lehigh."

Could not obtain analysis of this iron.

LEHIGH STEEL AND IRON COMPANY, Allentown, Lehigh County. Stacks, 2. Total capacity, 57,000 tons per year. Fuel, anthracite coal and coke. Ores, Lehigh County and Lake Superior hematite and New Jersey magnetic. Brand, "Lehigh."

Could not obtain analysis of this iron.

LOGAN IRON AND STEEL COMPANY, Lewistown, Mifflin County. Emma Furnace. Stacks, 1. Capacity, 12,000 tons per year. Fuel, coke. Ores, Lake Superior red hematite, carbonate, and red fossiliferous. Brand, "Emma."

Could not obtain analysis of this iron.

LOGAN IRON AND STEEL COMPANY, Greenwood, Huntingdon County. Greenwood Furnace. Stacks, 1. Capacity, 3200 tons per year. Fuel, charcoal (cold blast). Ore, red fossiliferous. Brand, "Greenwood."

This company make five grades of Cold Blast charcoal pig iron all of which are used in the manufacture of chilled car wheels, chilled rolls, etc., and is graded by the broken granular surface into Nos. 1, 2, 3, 4 or mottled and white iron.

PENNSYLVANIA (Continued)

MAIDEN CREEK FURNACE, Lenhartsville, Berks County. Stacks, 1. Capacity, 3500 tons per year. Fuel, charcoal. Ores, hematite and local magnetite. Brand, "Maiden Creek."

McCOY AND LINN, Milesburg, Centre County. Hecla Furnace. Stacks, 1. Capacity, 1800 tons per year. Fuel, charcoal (cold blast). Ore, hematite from Nittany Valley. Brand, "Hecla."

	Average analysis.
Silicon	.790
Phosphorus	1.025
Sulphur	.020
Manganese	.650
Combined Carbon	.600
Graphitic Carbon	2.930

MONT ALTO IRON WORKS, Mont Alto, Franklin County. Mont Alto Furnace. Stacks, 1. Capacity, 10,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Mont Alto."

Could not obtain analysis of this iron.

NATIONAL STEEL COMPANY, Newcastle Works, Newcastle, Lawrence County. Stacks, 4. Total capacity, 450,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

NATIONAL TUBE COMPANY, McKeesport. Monongahela Furnaces. Stacks, 2. Total capacity, 250,000 tons per year. Fuel, Connellsville Bee Hive coke. Ore, Lake Superior.

Silicon	1.510
Phosphorus	.090
Sulphur	.020
Manganese	.850
Carbon	4.030

NATIONAL STEEL COMPANY, Sharon Works, Sharon, Mercer County. Stacks, 2. Total capacity, 73,000 tons per year. Fuel, coke. Ore, Lake Superior.

Could not obtain analysis of this iron.

NORRISTOWN IRON WORKS, Norristown, Montgomery County. Stacks, 1. Capacity, 25,000 tons per year. Fuel, anthracite coal and coke. Ore, principally foreign. Brand, "Acme."

Could not obtain analysis of this iron.

PENNSYLVANIA (Continued)

PAXTON IRON AND STEEL COMPANY, THE—Harrisburg, Dauphin County. Paxton Furnaces. Stacks, 2. Total capacity, 70,000 tons per year. Fuel, anthracite coal and coke. Ores, various kinds. Brands, "Paxton" and "Silver Spring."

Could not obtain analysis of this iron.

PENNSYLVANIA STEEL COMPANY, THE—Steelton, Dauphin County. Stacks, 5. Total capacity, 300,000 tons per year. Fuel, anthracite coal and coke. Ores, Lake.

	Bessemer.	Low Phosphorus.	Basic.
Silicon	1.50	..	Low
Phosphorus	below .10	.03	.20 to .25
Sulphur	below .05	.03	below .05

PENNSYLVANIA FURNACE COMPANY, Sheridan, Lebanon County. Sheridan Furnaces. Stacks, 2. Total capacity, 56,000 tons per year. Fuel, anthracite coal and coke. Ores, Cornwall and Lake Superior. Brands, "Sheridan" and "Vulcan."

	Foundry and Forge.	Bessemer.
Silicon	1.70 to 3.00	2.00 to 3.50
Phosphorus	.50 to 1.00	.03 to .06
Sulphur	.02 to .08	.01 to .05
Combined Carbon	.20	.10
Graphitic Carbon	3.00	3.10

PERKINS AND COMPANY, LIMITED, Sharpsville, Mercer County. Mabel Furnaces. Stacks, 2. Total capacity, 70,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Mabel."

	No. 1 Foundry.
Silicon	1.080
Phosphorus	.103
Sulphur	.023
Manganese	1.360
Combined Carbon	.500
Graphitic Carbon	3.010

PICKANDS, MATHER AND COMPANY, Alice Furnace at Sharpsville and Ella Furnace at West Middlesex. Stacks, 2. Total capacity, 156,000 tons per year. Fuel, coke. Ore, Lake Superior. Brands, "Alice" and "Ella."

Bessemer and Foundry.	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	2.00	1.25	1.00	.75
Phosphorus	.25	.25	.25	.25
Sulphur	04	.04	.04	.04
Manganese	.60	.60	.60	.60
Combined Carbon	.35	.35	....	..
Graphitic Carbon	3.00	3.00	...	

POTTSVILLE IRON AND STEEL COMPANY, Pottsville, Schuylkill County. Pioneer Furnaces. Stacks, 2. Total capacity, 40,000 tons per year. Fuel, anthracite coal. Ores, foreign, Lake Superior and New Jersey magnetic. Brand, "Pioneer."

Could not obtain analysis of this iron.

PENNSYLVANIA (Continued)

POTTSTOWN IRON COMPANY, Pottstown, Montgomery County. Anvil Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetic and hematite. Brand, "Anvil."

Could not obtain analysis of this iron.

POTTS, WILLIAM M., Wyebrooke, Chester County. Isabella Furnace. Stacks, 1. Capacity, 5400 tons per year. Fuel, charcoal (cold blast). Ores, magnetic and hematite. Brand, "Wyebrooke."

	No. 1.
Silicon	.464
Phosphorus	.312
Sulphur	.026
Manganese	.861
Combined Carbon	.822
Graphitic Carbon	3.598

PUNXSUTAWNEY IRON COMPANY, Punxsutawney, Jefferson County. Punxy Furnace. Stacks, 1. Capacity, 85,000 tons per year. Fuel, coke. Ores, Lake Superior, hematite and specular. Brand, "Punxy."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 1 Soft.	No. 2 Soft.	No. 3.	Grey Forge.
Silicon	2.75	2.50	2.25	2.75	2.50	2.00	1.75
Phosphorus	.40	40	.40	.40	.40	.40	.40
Sulphur	.02	.03	.05	.03	.04	.05	.07
Manganese	.65	.60	.59	.65	.60	.58	.58

READING IRON COMPANY, Emaus, Lehigh County. Crumwold Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ores, Lake Superior, hematite and magnetic.

	No. 1 X.	No. 2 X.	No. 2 Plain.
Silicon	2.50 to 3.25	2.50 to 3.00	2.00 to 2.50
Phosphorus	.40 to .70	.40 to .70	.40 to 70
Sulphur	.01 to .03	.02 to .05	.03 to .07
Manganese	.20 to .50	.20 to .50	.20 to .50
Combined Carbon	.10 to .15	.15 to .20	.20 to .40
Graphitic Carbon	3.00 to 3.50	2.75 to 3.00	2.75 to 3.00

READING IRON COMPANY, Reading, Berks County. Keystone Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ores, Lake Superior, hematite and magnetic.

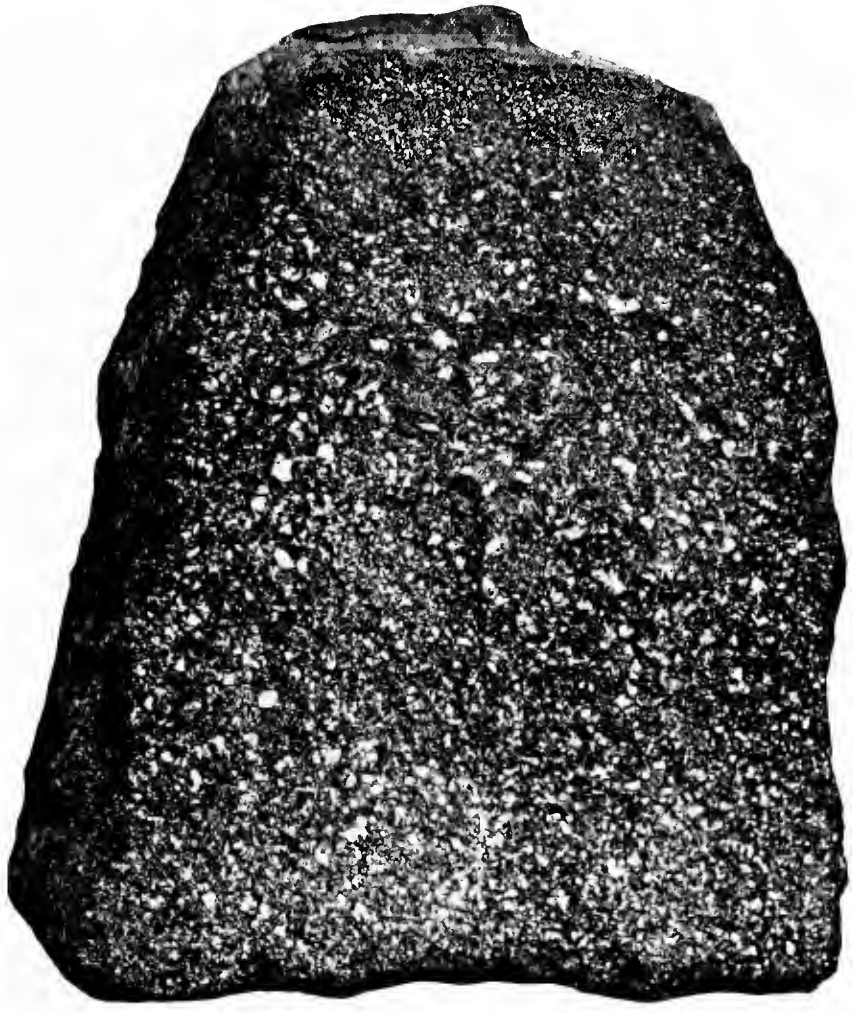
Analysis of this iron same as made by this company at Crumwold furnace. See above.

REPUBLIC IRON AND STEEL COMPANY (formerly called Sharon Furnace). Sharon, Mercer County. Hall Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior.

	No. 2.	No. 3.	No. 4.
Silicon	1.600	.920	.74
Phosphorus	.290	.290	.32
Sulphur	.025	.028	.04
Manganese	.620	.560	.43
Combined Carbon	.150	.280	.75
Graphitic Carbon	3.590	3.260	2.49

PENNSYLVANIA (Continued)

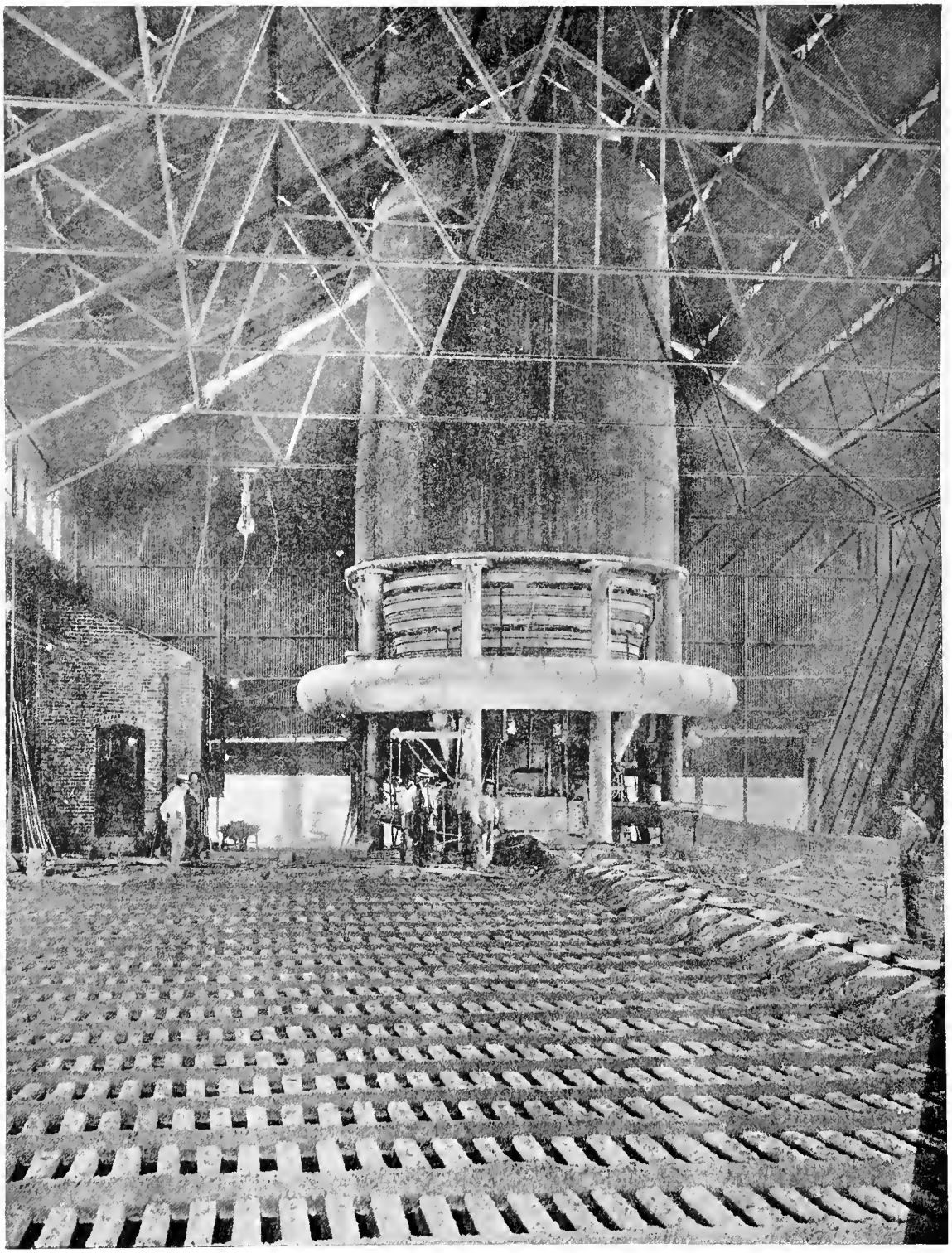
PUNXSUTAWNEY IRON COMPANY.



No. 2 "PUNXY."

PENNSYLVANIA (Continued)

PUNXSUTAWNEY IRON COMPANY



PUNXSUTAWNEY FURNACE.

Ready for the Cast.

PENNSYLVANIA (Continued)

PUNXSUTAWNEY IRON COMPANY

GRADING PUNXSUTAWNEY IRON.

PENNSYLVANIA (Continued)

PUNXSUTAWNEY IRON COMPANY.

WORM'S EYE VIEW OF PUNXSUTAWNEY FURNACE.

PENNSYLVANIA (Continued)

ROBESONIA IRON COMPANY, LIMITED, Robesonia, Berks County. Robesonia Furnace. Stacks, 1. Capacity, 55,000 tons per year. Fuel, coke. Ore, roasted Cornwall alone. Brand, "Robesonia."

	Low Phosphorus.
Silicon	3.000 to 3.500
Phosphorus	.020
Sulphur	.010
Manganese	None
Combined Carbon	.083
Graphitic Carbon	3.140

ROCKHILL IRON AND COAL COMPANY, Huntingdon County. Rockhill Furnaces. Stacks, 2. Total capacity, 30,000 tons per year. Fuel, coke. Ore, local. Brand, "Rockhill."

	No. 1.	No. 2.	Grey Forge.
Silicon	2.530	2.790	1.680
Phosphorus	.499	451	.514
Sulphur	.024	.031	.040
Combined Carbon	....	.150	....
Graphitic Carbon	....	3.897	...

SAXTON IRON COMPANY, Saxton, Bedford County. Saxton Furnaces. Stacks, 2. Total capacity, 45,000 tons per year. Fuel, coke. Ores, native and Lake Superior.

Could not obtain analysis of this iron.

SHARPSVILLE FURNACE COMPANY, Sharpsville, Mercer County. Sharpsville Furnace. Stacks, 1. Capacity, 72,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Sharpsville."

Could not obtain analysis of this iron.

SOUTH MOUNTAIN MINING AND IRON COMPANY, Cumberland County. Pine Grove Furnace. Stacks, 1. Capacity, 5000 tons per year. Fuel, charcoal. Ore, hematite. Brand, "Pine Grove."

Could not obtain analysis of this iron.

SPEARMAN IRON COMPANY, THE—Sharpsville, Mercer County. Spearman Furnace. Stacks, 1. Capacity, 72,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Spearman."

Could not obtain analysis of this iron.

PENNSYLVANIA (Continued)

STEWART IRON COMPANY, LIMITED, Sharon, Mercer County. Stewart Furnace. Stacks, 1. Capacity, 82,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Stewart."

LOW PHOSPHORUS.

Grade No. 1. Guaranteed, Phosphorus not to exceed .03; Silicon not to exceed 1.00 and Sulphur not over .030.
Grade No. 2. Guaranteed, Phosphorus from .031 to .040; Silicon and Sulphur as above.
Grade No. 3. Guaranteed, Phosphorus from .041 to .050; Silicon and Sulphur as above.

REGULAR BESSEMER.

Guaranteed, Phosphorus not to exceed .10; Silicon 1.00 to 1.50 and Sulphur not over .050.

SUSQUEHANNA IRON AND STEEL COMPANY, Vesta, Lancaster County. Vesta Furnace. Stacks, 1. Capacity, 25,000 tons per year. Fuel, anthracite coal and coke. Ores, hematite and magnetite. Brand, "Vesta."

Could not obtain analysis of this iron.

SUSQUEHANNA IRON AND STEEL COMPANY, Wrightsville, York County. Aurora Furnace. Stacks, 1. Capacity, 30,000 tons per year. Fuel, anthracite coal and coke. Ore, native. Brand, "Aurora."

Could not obtain analysis of this iron.

SWATARA FURNACE, Union Deposit, Dauphin County. Stacks, 1. Capacity, 18,000 tons per year. Fuel, anthracite coal and coke. Ores, magnetite, brown hematite and fossil.

Could not obtain analysis of this iron.

TEMPLE IRON COMPANY, Temple, Berks County. Temple Furnace. Stacks, 1. Capacity, 25,000 tons per year. Fuel, anthracite coal and coke. Ores, Lake Superior and local hematite and New Jersey magnetic. Brand, "Temple."

Mill Iron.

Silicon	.50 to 1.00
Phosphorus	.40 to .90
Sulphur	.10 to .05

PENNSYLVANIA (Continued)

THOMAS IRON COMPANY, THE—Hokendauqua, Lehigh County. Stacks, 9. Total capacity, 240,000 tons per year. Fuel, anthracite coal and coke. Ores, foreign, Lake Superior, local brown hematite and New Jersey magnetic. Brand, "Thomas."

	No. 1 X.	No. 2 X.
Silicon	2.426	2.095
Phosphorus	1.100	1.116
Sulphur	.020	.020
Manganese	.187	.126
Combined Carbon	.200	.500
Graphitic Carbon	3.500	3.000

WARWICK IRON AND STEEL COMPANY, Pottstown, Montgomery County. Warwick Furnace. Stacks, 1. Capacity, 65,000 tons per year. Fuel, one-quarter anthracite coal and three-quarters coke. Ores, New Jersey and New York magnetites and Lake Superior. Brand, "Warwick."

	No. 1 X.	No. 2 X Soft.	No. 2 X Strong.	No. 2 Plain.	Malleable and No. 2 mill.	No. 3
Silicon	2.00 to 3.00	2.00 to 3.00	1.50 to 2.00	2.00 to 3.00	1.00 to 1.50	1.00 to 1.75
Phosphorus	.40 to .50	.40 to .50	.40 to .50	.40 to .50	.30 to .50	.40 to .50
Sulphur	.01 to .03	.02 to .04	.02 to .05	.02 to .06	.03 to .05	.04 to .08
Manganese	.40 to .60	.40 to .60	.40 to .60	.40 to .60	.40 to .60	.40 to .60
Combined Carbon	.10 to .30	.20 to 40	.20 to .40	.20 to .50	3.50 to 4.00	3.00 to 3.30
Graphitic Carbon	3.40 to 3.70	3.30 to 3.60	3.30 to 3.60	3.30 to 3.50		

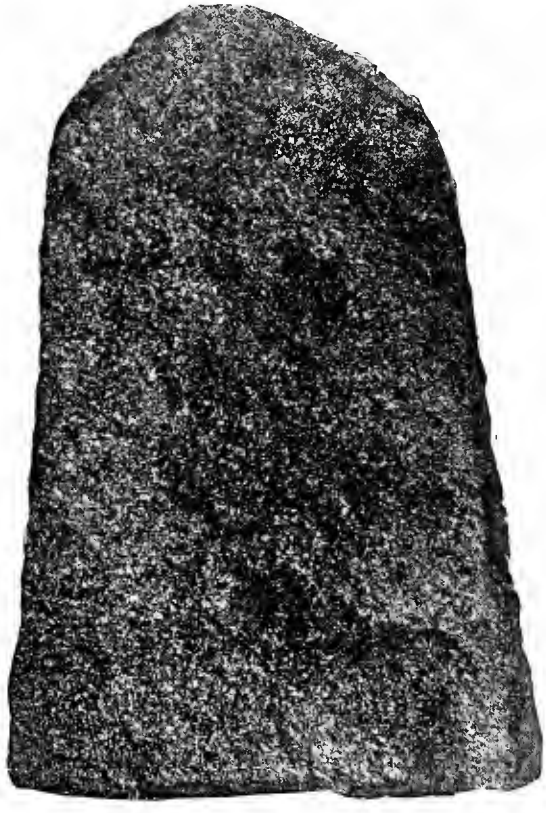
WELLMAN FURNACE, Thurlow, Delaware County. Stacks, 1. Capacity, 40,000 tons per year. Fuel, anthracite coal and coke. Ore, foreign.

Could not obtain analysis of this iron.

TENNESSEE

BUFFALO IRON COMPANY, Mannie, Wayne County. Stacks, 2. Total capacity, 36,000 tons per year. Fuel, charcoal. Ore, local brown hematite. Brand, "Mannie."

	Average analysis.
Silicon	2.00 to 5.00
Phosphorus	1.95 to 2.25
Sulphur	.01 to .03
Manganese	.40 to .50
Combined Carbon	.10 to .15
Graphitic Carbon	2.85 to 3.25



MANNIE PIG IRON.

TENNESSEE (Continued)

CHATTANOOGA FURNACE COMPANY, Chattanooga, Hamilton County. Chattanooga Furnace. Stacks, 1. Capacity, 24,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Chattanooga."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 1 Soft.	No. 2 Soft.	No. 4 Foundry.	Grey Forge.
Silicon	2.241	2.164	1.981	3.042	2.864	1 821	1 146
Phosphorus	.884	.862	.891	.872	.886	.847	.888
Sulphur	.004	.005	.008	Trace	Trace	.007	.010
Manganese	.521	.504	.476	.641	.589	406	.392
Combined Carbon	.290	.320	410	.140	.180	.440	.660
Graphitic Carbon	3.541	3.340	3.221	3.389	3.300	3 204	2.891

CITICO FURNACE COMPANY, Chattanooga, Hamilton County. Citico Furnace. Stacks, 1. Capacity, 48,000 tons per year. Fuel, coke. Ores, Tennessee and Georgia red and brown hematite. Brand, "Citico."

	Average analysis.
Silicon	2.50
Phosphorus	1.23
Sulphur	.06
Manganese	.83
Combined Carbon	.26
Graphitic Carbon	2.80

DAYTON COAL AND IRON COMPANY, THE—Dayton, Rhea County. Stacks, 2. Total capacity, 72,000 tons per year. Fuel, coke. Ores, Tennessee fossil and Georgia hematite. Brand, "Dayton."

Could not obtain analysis of this iron.

GRACEY-WOODWARD IRON COMPANY, Clarksville, Montgomery County. Stacks, 1. Capacity, 36,000 tons per year. Fuel, coke. Ore, local brown hematite.

Could not obtain analysis of this iron.

NAPIER IRON WORKS, Napier, Lewis County. Stacks, 1. Capacity, 30,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Napier."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	2.662	2.0120	1.734	1.511	.1470
Phosphorus	.786	7920	.829	.861	.7000
Sulphur	.005	.0003	.023	.001	.0013
Manganese	.200	. . .	.182	....	.....
Total Carbon	3.027	3.665	3.536	3.712	3.8120

ROANE IRON COMPANY, Rockwood, Roane County. Rockwood Furnace. Stacks, 1. Capacity, 50,000 tons per year. Fuel, coke. Ore, red fossiliferous. Brand, "Rockwood."

	No. 2 Foundry.
Silicon	2.65
Phosphorus	1.40
Sulphur	.01
Manganese	.40
Combined Carbon	.30
Graphitic Carbon	3.00

TENNESSEE (Continued)

TENNESSEE COAL, IRON AND RAILROAD COMPANY, Cowan, Franklin County. Sewanee Furnace. Stacks, 1. Capacity, 54,000 tons per year. Fuel, coke. Ores, soft red fossiliferous and brown hematite. Brand, "Sewanee."

Could not obtain analysis of this iron.

TENNESSEE COAL, IRON AND RAILROAD COMPANY, South Pittsburg, Marion County. South Pittsburg Furnaces. Stacks, 3. Total capacity, 175,000 tons per year. Fuel, coke. Ores, brown hematite and hard red fossiliferous. Brand, "South Pittsburg."

	No. 1 Soft.	No. 2 Soft.	No. 2 Foundry.	No. 3 Foundry.	Grey Forge.
Silicon	2.690	2.760	2.450	1.910	1.890
Phosphorus	1.460	1.260	1.400	1.460	1.230
Sulphur	.013	.016	.016	.023	.019
Manganese	.930	.930	.930	.930	
Combined Carbon	.370	.380	420	.450	
Graphitic Carbon	3.450	3.410	3.190	2.970	

VIRGINIA IRON, COAL AND COKE COMPANY, Johnson City ,Washington County. Carnegie Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, Cranberry. Brand, "Carnegie."

	Bessemer.	Special Bessemer.
Silicon	1.200	.75 to 1.500
Phosphorus	.050	.024
Sulphur	.020	.012
Manganese	.750	.740
Combined Carbon	710	.60 to .800
Graphitic Carbon	3.300	3.20 to 3.500

VIRGINIA IRON, COAL AND COKE COMPANY, Embreville, Washington County. Embreville Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, local brown hematite. Brand, "Embreville."

	No. 2 Soft.	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 X.	Grey Forge.
Silicon	3.750	3.100	2.900	2.410	2.200	1.710
Phosphorus	.300	.350	.450	.450	450	.450
Sulphur	.010	.012	.012	.014	.018	.022
Manganese	.860	.800	.750	.910	.800	.740
Combined Carbon	.090	.120	.130	.150	.190	.380
Graphitic Carbon	3.600	3.520	3.480	3.390	3.330	3.220

TENNESSEE (Continued)

WHITE, DIXON AND COMPANY, Bear Spring, Stewart County. Bear Spring Furnace. Stacks, 1. Capacity, 4000 tons per year. Fuel, charcoal (cold blast.) Ore, brown hematite. Brand, "Dover."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	1.630	1.000	476	.250
Phosphorus	.374	.390	.363	.254
Sulphur	010	.010	.009	.010
Manganese	.210	.180	.200	.190
Carbon	3.980	3.845	3.945	3.850

TEXAS

JEFFERSON IRON COMPANY, Jefferson, Marion County. Jefferson Furnace. Stacks, 1. Capacity, 13,500 tons per year. Fuel, charcoal. Ores, local brown, fossiliferous and carbonate. Brand, "Jefferson."

GRADING CARD.

Grades.	Average Silicon.
Lone Star Silvery or Scotch Softeners	3.50% to 5.00%
Softeners (No. 1 and No. 2)	2.75% to 3.50%
No. 1 Foundry "High"	2.50% to 3.00%
No. 1 Foundry "Low"	1.75% to 2.50%
No. 2 Foundry "High"	2.25% to 2.75%
No. 2 Foundry "Low"	1.60% to 2.30%
No. 3 Foundry "High"	1.60% to 2.25%
No. 3 Foundry "Low"	1.50% to 2.00%
No. 4 Foundry "High"	1.50% to 1.90%
No. 4 Foundry "Low"	1.25% to 1.75%
No. 2 "Car Wheel"	1.10% to 1.30%
No. 3½ "Car Wheel"	1.00% to 1.25%
No. 4 "Car Wheel"	.60% to 1.00%
No. 5 "Car Wheel"	.50% to .70%
No. 6 "Car Wheel"	.30% to .50%

Phosphorus varies from	.11% to .20%
Manganese " "	.30% to .60%
Sulphur " "	Trace to .05%

This company makes iron suitable for malleable, car-wheel and foundry purposes.

OLD ALCALDE FURNACE, Rusk, Cherokee County. Stacks, 1. Capacity, 10,000 tons per year. Fuel, charcoal. Ore, brown hematite. Brand, "Old Alcalde."

	No. 1.	No. 2.	No. 3.
Silicon	1.810	1.780	.820
Phosphorus	.404	.416	.350
Sulphur	.069	.046	Trace
Manganese	Trace	Trace	Trace
Combined Carbon	1.280	1.280	.780
Graphitic Carbon	1.960	1.890	....

TEXAS (Continued)

STAR AND CRESCENT IRON FURNACE, Rusk, Cherokee County. Stacks, 1. Capacity, 18,000 tons per year. Fuel, charcoal. Ores, brown hematite. Brand, "Star and Crescent."

	Average analysis.
Silicon	2.050
Phosphorus	.668
Sulphur	.003
Manganese	Trace
Combined Carbon	.580
Graphitic Carbon	2.390

TASSIE BELLE FURNACE, New Birmingham, Cherokee County. Stacks, 1. Capacity, 13,500 tons per year. Fuel, charcoal. Ore, local brown hematite. Brand, "Tassie Belle."

Could not obtain analysis of this iron.

VIRGINIA

ALLEGHANY IRON COMPANY, Iron Gate, Alleghany County. Alleghany Furnace. Stacks, 1. Capacity, 35,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Alleghany."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 Foundry.	Grey Forge.
Silicon	2.75	2.50	2.00	1.75	1.00
Phosphorus	.35	.35	.35	.35	.35
Sulphur	.03	.04	.05	.06	.07
Manganese	1.25	1.25	1.25	1.25	1.25
Combined Carbon	.18	.25	.40	.60	2.85
Graphitic Carbon	3.50	3.35	3.15	3.00	.75

BIG STONE GAP IRON COMPANY, Big Stone Gap, Wise County. Stacks, 2 (one in blast). Capacity, 36,500 tons per year. Fuel, coke. Ore, fossil. Brand, "Big Stone Gap."

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	3.180	3.120	2.500	1.610	1.000
Phosphorus	.592	.546	.571	.580	.586
Sulphur	.012	.009	Trace	.010	.015
Manganese	.356	.300	.312	.280	.305
Combined Carbon	.120	.210	.400	.630	.750
Graphitic Carbon	3.080	2.410	1.910	1.750	1.500

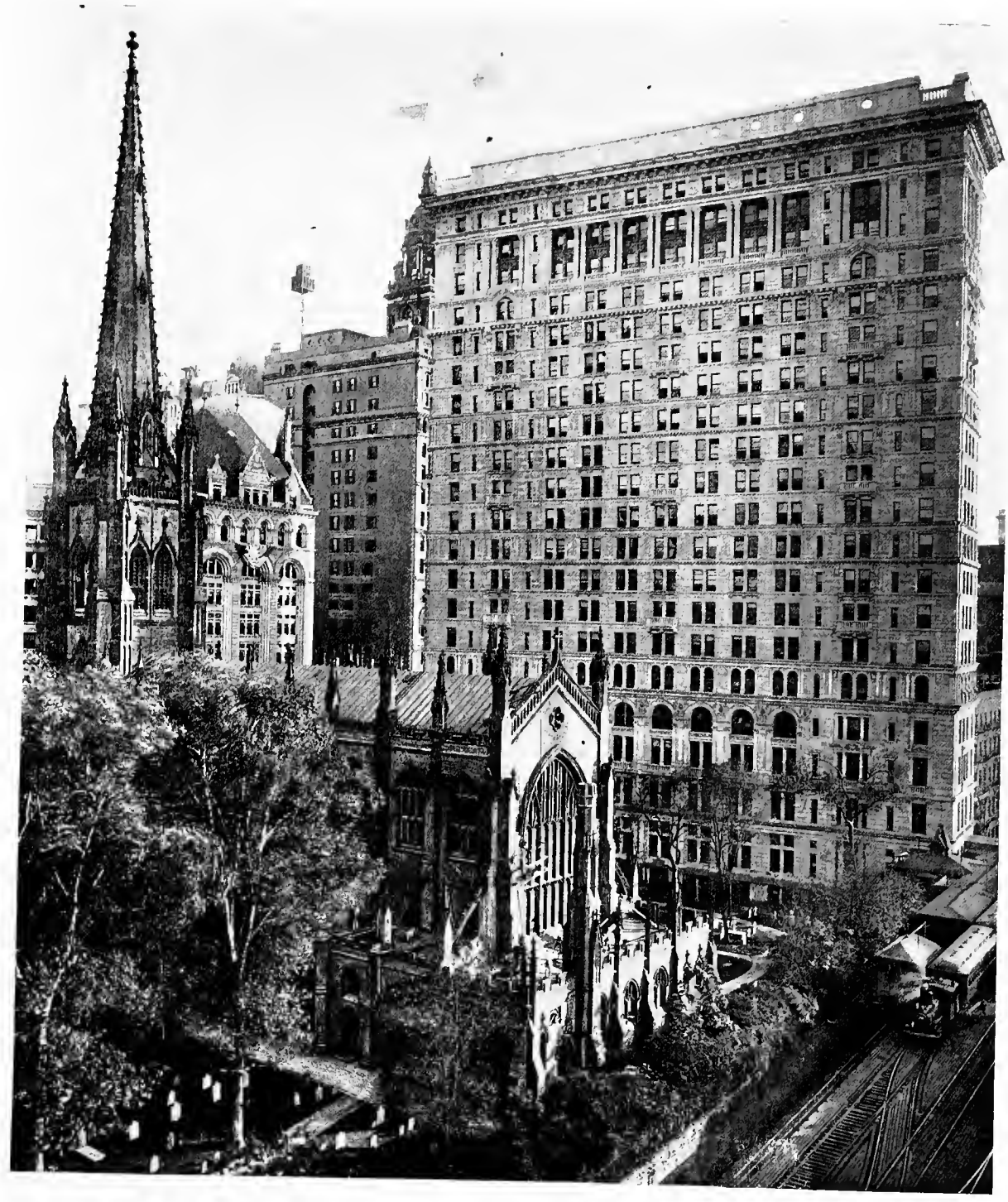
EMPIRE STEEL AND IRON COMPANY, Shenandoah, Page County. Gem Furnace. Stacks, 1. Capacity, 36,000 tons per year. Fuel, Pocahontas coke. Ore, brown hematite. Brand, "Shenandoah" ("Gem").

	No. 1.	No. 2.	No. 3.	Grey Forge.	Basic Bessemer.*
Silicon	2.750	2.500	2.100	1.00	1.00 and under
Phosphorus	.850	.850	.850	.85	2.00 or over
Sulphur	.015	.020	.035	.06	.05 or under
Manganese	1.250	1.250	1.250	1.25	2.00 or over
Combined Carbon	.200	.250	.300	.45	...
Graphitic Carbon	3.250	3.000	2.750	2.50	....

*This is iron used in the Thomas Gilchrist process.

VIRGINIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



EMPIRE BUILDING, BROADWAY AND RECTOR STREET,
NEW YORK CITY, NEW YORK.
Offices of Empire Steel and Iron Co., Nos. 1213 and 1214.
Trinity Church in the foreground.

VIRGINIA (Continued)

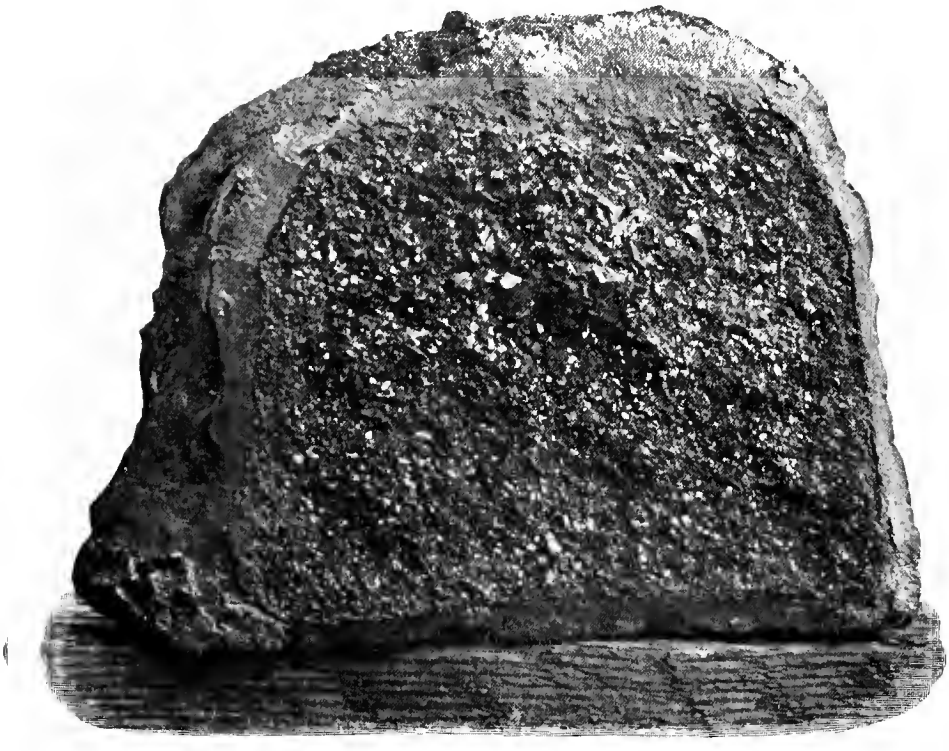
EMPIRE STEEL AND IRON COMPANY, Goshen, Rockbridge County. Victoria Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, New River coke. Ores, native brown (limonites.) Brand, "Victoria."

	No. 1 Foundry.	No. 2 Foundry.	No. 2 Plain.	No. 3 Foundry.	Grey Forge.	No. 1 Soft.
Silicon	2.770	2.320	2.090	2.020	1.160	3.030
Phosphorus	.709	.950	.793	.839	.974	.681
Sulphur	.018	.033	.019	.029	.057	.018
Manganese	.580	.580	.560	.440	.500	.540
Combined Carbon	.160	.260	.510	.790	1.700	.060
Graphitic Carbon	3.500	3.120	2.750	2.560	2.120	3.550

NO. 1 SOFT VICTORIA.

VIRGINIA (Continued)

EMPIRE STEEL AND IRON COMPANY.



No. 1 FOUNDRY VICTORIA.

VIRGINIA (Continued)

EMPIRE STEEL AND IRON COMPANY.

No. 2 FOUNDRY VICTORIA.

VIRGINIA (Continued)

EMPIRE STEEL AND IRON COMPANY.

No. 1 STRONG VICTORIA.

VIRGINIA (Continued)

EMPIRE STEEL AND IRON COMPANY.

HUDDLESTON MINE, POTTS VALLEY, VA., SHOWING INCLINE.

(Ore used at Victoria Furnace.)

VIRGINIA (Continued)

LIBERTY FURNACE, Shenandoah County. Stacks, 1. Capacity, 15,000 tons per year. Fuel, charcoal. Ore, local limonite. Brand, "Liberty."

Could not obtain analysis of this iron.

LONGDALE IRON COMPANY, Longdale, Alleghany County. Stacks, 2. Total capacity, 40,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Longdale."

	Basic.
Silicon.....	not over 1.00
Sulphur.....	" " .05

LOW MOOR IRON COMPANY OF VIRGINIA, THE—Alleghany County. Stacks, 3. Capacity, 90,000 tons per year. Fuel, New River coke. Ore, local brown hematite. Brands, "Low Moor" and "Covington."

Could not obtain analysis of this iron.

NANNIE B. FURNACE, Reusens, Campbell County. Stacks, 1. Capacity, 15,000 tons per year. Fuel, coke. Ores, specular and brown hematite. Brand, "Virginia."

Could not obtain analysis of this iron.

NEW RIVER MINERAL COMPANY, Wythe County. Ivanhoe Furnace. Stacks, 1. Capacity, 25,000 tons per year. Fuel, Pocahontas coke. Ores, local brown hematite and limonite. Brand, "Ivanhoe."

Could not obtain analysis of this iron.

PRINCESS FURNACE, Glen Wilton, Botetourt County. Stacks, 1. Capacity, 15,000 tons per year. Fuel, coke. Ore, hematite. Brand, "Princess."

	No. 1.	No. 2.	No. 3.
Silicon.....	2.250 to 2.750	2.000 to 2.750	2.000 to 2.750
Phosphorus.....	.600 to .700	.600 to .700	.600 to 700
Sulphur.....	.015 to .026	.015 to .026	.015 to .026
Manganese.....	.400 to .800	.400 to .800	.400 to .800
Combined Carbon.....	.110	.130	.180
Graphitic Carbon.....	3.970	3.750	3.680

VIRGINIA (Continued)

PULASKI IRON COMPANY, Pulaski City, Pulaski County. Stacks, 1. Capacity, 50,000 tons per year. Fuel, Pocahontas coke. Ores, brown hematite and limonite.

	No. 2 X.	No. 2 Plain.	No. 3.
Silicon	3.000	3.000	3.000
Phosphorus	.400	.400	.400
Sulphur	.020	.025	.035
Manganese	.900	.900	.900
Combined Carbon	.190	.280	.360
Graphitic Carbon	3.200	3.000	2.750

RADFORD IRON COMPANY, Pulaski County. Radford Furnace. Stacks, 1. Capacity, 2500 tons per year. Fuel, charcoal.

Could not obtain analysis of this iron.

ROANOKE FURNACE COMPANY, Roanoke, Roanoke County. Stacks, 1. Capacity, 55,000 tons per year. Fuel, coke. Ore, brown hematite. Brand, "Roanoke."

	No 1 X.	No. 2 X.	No. 2 Plain.	No. 3 Foundry.	Grey Forge.
Silicon	3.000	2.750	2.400	2.000	1.750
Phosphorus	.800	.800	.800	.800	.800
Sulphur	.020	.030	.040	.050	.060
Manganese	.750	.750	.750	.750	.750
Combined Carbon	.200	.300	.500	.700	.900
Graphitic Carbon	3.650	3.500	3.200	2.900	2.600

SALEM FURNACE, Salem, Roanoke County. Stacks, 1. Capacity, 35,000 tons per year. Fuel, coke. Ore, local hematite. Brand, "Salem."

Could not obtain analysis of this iron.

VAN BUREN FURNACE, Shenandoah County. Stacks, 1. Fuel, charcoal. Ore, from Grindstone Bank.

	No. 1.	No. 2.
Silicon	.91	.35
Phosphorus	.14	.16
Sulphur	Trace	.02
Manganese	.36	.52
Combined Carbon	.19	.65
Graphitic Carbon	2.65	2.37

VIRGINIA (Continued)

VIRGINIA IRON, COAL AND COKE COMPANY, Graham, Tazewell County. Graham Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, coke. Ores, fossil and hematites. Brand, "Graham."

	Average analysis Foundry.
Silicon	2.903
Phosphorus	449
Sulphur	.037
Manganese	.392
Combined Carbon	.170
Graphitic Carbon	3.130

VIRGINIA IRON, COAL AND COKE COMPANY, Radford, Montgomery County. Radford Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, coke. Ores, limonite and mountain.

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 X.	No. 3 C.	Forge.
Silicon	3.220	2.580	2.450	2.250	2.000	1.560
Phosphorus	.800	.850	.850	.980	.900	.900
Sulphur	.018	.020	.028	.032	.032	.061
Manganese	.900	.950	1.000	1.050	1.100	1.100
Combined Carbon	.180	.210	.290	.290	.310	.480
Graphitic Carbon	3.460	3.270	3.250	3.200	3.180	3.010

VIRGINIA IRON, COAL AND COKE COMPANY, Reed Island, Pulaski County. Reed Island Furnace. Stacks, 1. Capacity, 2500 tons per year. Fuel, charcoal (cold blast). Ore, local hematite.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	.990	.670	.580	.490	.710
Phosphorus	.185	.160	.150	.240	.240
Sulphur	.029	.030	.034	.038	.039
Manganese	.310	.200	.140	.110	.050

VIRGINIA IRON, COAL AND COKE COMPANY, Bristol, Washington County. Bristol Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ores, brown hematite and fossil. Brand, "Bristol."

	No. 2 Soft.	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 X.	No. 3. C.	Foundry Forge.	Grey Forge.
Silicon	3.510	2.480	2.220	1.900	1.750	1.520	1.180	.880
Phosphorus	.580	.620	.600	.600	.700	.650	.650	.650
Sulphur	.012	.012	.017	.022	.023	.021	.040	.044
Manganese	.280	.280	.300	.400	.450	.250	.250	.250
Combined Carbon	.110	.210	.230	.230	.200	.310	.340	.680
Graphitic Carbon	3.580	3.260	3.240	3.230	3.200	3.140	3.010	2.780

VIRGINIA (Continued)

VIRGINIA IRON, COAL AND COKE COMPANY, Roanoke, Roanoke County. Crozer Furnaces. Stacks, 2. Total capacity, 90,000 tons per year. Fuel, coke. Ores, Oriskany, limonite and mountain. Brand, "Crozer."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 X.	Grey Forge.
Silicon	2.950	2.710	2.510	2.010	1.100
Phosphorus	.630	.630	.720	.640	.630
Sulphur	.025	028	.028	.030	.065
Manganese	.910	.900	.980	.790	.810
Combined Carbon	.120	.170	.220	.280	.520
Graphitic Carbon	3.480	3.410	3.280	3.120	2.870

VIRGINIA IRON, COAL AND COKE COMPANY, Pulaski, Pulaski County. Dora Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, limonite. Brand, "Dora."

	No. 1 X.	No. 2 X.	No. 2 Plain.	No. 3 X.	No. 3 C.	No. 4 X.
Silicon	3.180	2.480	2.420	2.080	1.740	1.410
Phosphorus	.380	.360	.460	.500	.500	.490
Sulphur	.016	.021	.030	.042	.040	.050
Manganese	.940	1.020	1.020	1.040	.980	.980
Combined Carbon	.100	.120	.190	.240	.200	.290
Graphitic Carbon	3.460	3.200	3.370	3.050	3.100	3.140

VIRGINIA IRON, COAL AND COKE COMPANY, Buena Vista, Rockbridge County. Buena Vista Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, coke. Ore, Oriskany. Brand, "Buena Vista."

	Basic.
Silicon	.500
Phosphorus	.350
Sulphur	.018
Manganese	2.130
Combined Carbon	1.000
Graphitic Carbon	2.100

VIRGINIA IRON, COAL AND COKE COMPANY, Max Meadows, Wythe County. Max Meadows Furnace. Stacks, 1. Capacity, 60,000 tons per year. Fuel, coke. Ores, limonite and mountain.

Could not obtain analysis of this iron.

WEST VIRGINIA

IRONDALE FURNACE, Independence, Preston County. Stacks, 1. Capacity, 16,000 tons per year. Fuel, coke. Ores, limonite and hematite. Brand, "F. N."

Could not obtain analysis of this iron.

WEST VIRGINIA (Continued)

NATIONAL TUBE COMPANY, Benwood, Marshall County. Riverside Furnace. Stacks, 1. Capacity, 80,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brand, "Riverside."

Could not obtain analysis of this iron.

WHEELING STEEL AND IRON COMPANY, Wheeling, Ohio County. Stacks, 2. Total capacity, 150,000 tons per year. Fuel, Connellsville coke. Ore, Lake Superior. Brands, "Belmont" and "Top Mill."

	Standard Bessemer.
Silicon	1.50 to 2.50
Phosphorus	not to exceed .10
Sulphur	" " " .05

WISCONSIN

ASHLAND IRON AND STEEL COMPANY, Ashland, Ashland County. Hinkle Furnace. Stacks, 1. Capacity, 45,000 tons per year. Fuel, charcoal. Ore, Gogebic. Brand, "Hinkle."

	No. 1 Foundry.	No. 2 to No. 6 Foundry.	Scotch.
Silicon	1.00 to 2.00	.10 to 1.25	2.25 to 3.00
Phosphorus	.12 to .18	.12 to .18	.12 to .18
Sulphur	Trace to .01	Trace to .01	Trace to .01
Manganese	.40 to .90	.40 to .90	.40 to .90
Combined Carbon	.30 to .40	.30 to .40	.30 to .40
Graphitic Carbon	3.30 to 3.80	3.30 to 3.80	3.30 to 3.80

GRADING CARD

Grades.	Average Silicon.
"A Scotch"	2.75%
"B Scotch"	2.50%
"C Scotch"	2.25%
No. 1 "Soft"	2.00%
No. 1 "Special"	1.75%
No. 1 "Foundry"	1.50%
No. 2 "Low"	1.25%
No. 2 "High"	1.00%
No. 3 "Low"	.80%
No. 3 "Medium"	.65%
No. 3 "High"	.55%
No. 4 "Low"	.45%
No. 4 "High"	.35%
No. 5 "Low"	.30% or less
No. 5 "High"	.20% "
No. 6 "White"	.10% to trace

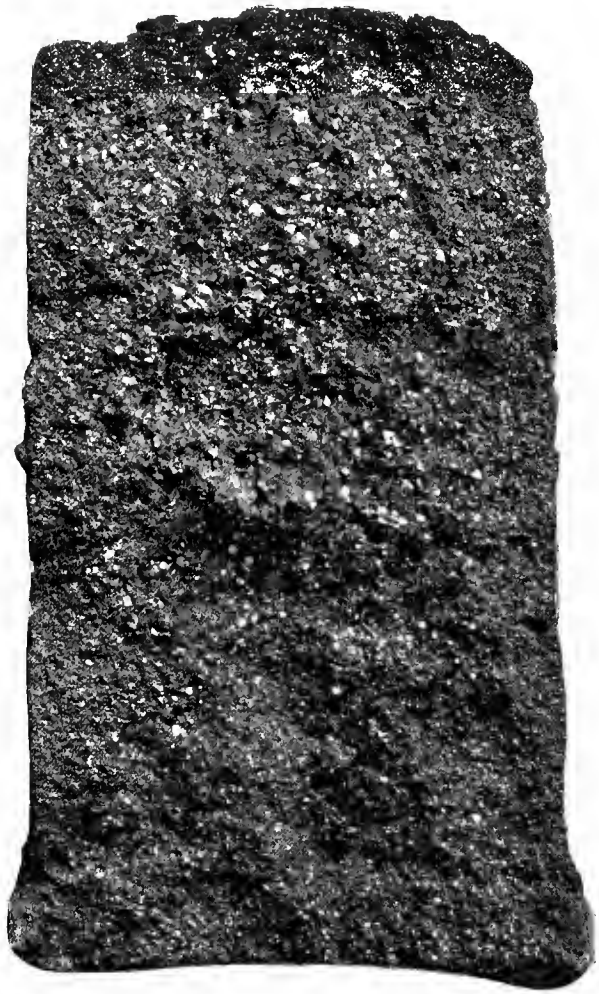
The grades from No. 3 "Low" to No. 6, both inclusive, are governed by the grain and chill of the pig in preference to the analysis.

"Special Cylinder," "Special Share," and other extra foundry grades to suit requirements.

"Hinkle Cold Blast." Special product made in small quantities.

WISCONSIN (Continued)

ASHLAND IRON AND STEEL COMPANY.



No. 1 SOFT HINKLE.

WISCONSIN (Continued)

ASHLAND IRON AND STEEL COMPANY, (Continued).

AMOUNT OF CHILL IN "HINKLE" PIG IRON.

No. 2 "High"	No chill
No. 3 "Low"	Feather chill
No. 3 "Medium"	1/8" to 3/8"
No. 3 "High"	3/8" to 3/4"
No. 4 "Low"	3/4" to 1 1/4"
No. 4 "High"	1 1/4" to 2"
No. 5 "Low"	Nearly white
No. 5 "High"	All white
No. 6	White iron

EAGLE FURNACE, Spring Valley, Pierce County. Stacks, 1. Capacity, 22,000 tons per year. Fuel, charcoal. Ore, brown hematite.

	Average analysis.
Silicon	.75 to 1.50
Phosphorus	.18 to .22
Manganese	.60 to .80
Combined Carbon	.30 to .70
Graphitic Carbon	2.60 to 2.70

ILLINOIS STEEL COMPANY, Milwaukee Works, Milwaukee. Bay View Furnaces. Stacks, 2. Total capacity 130,000 tons per year. Fuel, Connellsville and Pocahontas coke. Ores, Lake Superior and Gogebic.

	Foundry.	Malleable Bessemer.
Silicon	1.50 to 2.25	.75 to 2.00
Phosphorus	.20 to .80	.10 to .20
Sulphur	below .05	below .05
Manganese	.20 to .75	.60 to 1.40

MINERVA PIG IRON COMPANY, Milwaukee. Minerva Furnace. Stacks, 1. Capacity, 40,000 tons per year. Fuel, coke. Ore, Lake Superior. Brand, "Minerva."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	2.25 and above	1.750 and above	1.25 and above	1.00 and above
Sulphur	.04 and below	.045 and below	.05 and below	.06 and below

NORTHWESTERN IRON COMPANY, THE—Mayville, Dodge County Mayville Furnace. Stacks, 1. Capacity 60,000 tons per year. Fuel, coke. Ores, Menominee, Gogebic and local. Brands, "Sidney" and "Gertrude."

	Sidney.				Malleable
	No. 1.	No. 2.	No. 3.	Gertrude.	Bessemer.
Silicon	2.25	1.75	1.30	3.000	1.80
Phosphorus	.65	.68	72	.750	.15
Sulphur	.03	.03	.04	.025	.03
Manganese	.50	.50	40	.550	.50

ENGLAND

CUMBERLAND

BAIN, JAS. AND COMPANY, Harrington. Brand, "Harrington."

Silicon	2.50 to 3.00
Phosphorus	.04
Sulphur	.04

CAMMEL, CHAS. AND COMPANY, LTD., Maryport and Workington. Brands, "Solway" and "Derwent"

Could not obtain analysis of this iron.

DISTINGTON HEMATITE IRON COMPANY, LTD., Distington. Capacity, 70,000 tons per year. Fuel, best Durham and Newcastle coke. Ore, native Cumberland hematite. Brand, "Distington."

	No 1.	No. 2.	No. 3.
Silicon	2.000 to 3.000	2.000 to 3.000	2.000 to 3.000
Phosphorus	.045	.045	.045
Sulphur	Trace to .025	Trace to .025	Trace to .025
Manganese	.180	.180	.180
Combined Carbon	.360	.360	.360
Graphitic Carbon	3.460	3.460	3.460

KIRK BROTHERS AND COMPANY, LTD., Workington. Brands, "Reedlands," "Marron" and "Westfield."

This Company's output is all used by themselves for the manufacture of Bar Iron and Castings.

LONSDALE HEMATITE SMELTING COMPANY, LTD., Whitehaven. Brand, "Lonsdale."

Could not obtain analysis of this iron.

LOWTHER HEMATITE IRON COMPANY, LTD., Workington. Brand, "Lowther."

Could not obtain analysis of this iron.

MILLOM AND ASKAM HEMATITE IRON COMPANY LTD., THE—Millom. Capacity, 250,000 tons per year. Fuel, Durham coke. Ores, Hodbarrow and other Cumberland and Furness hematites. Brands, "Millom Hematite" and "Askam Hematite."

	No. 1.	No. 2.	No. 3.	Special.	Mixed.
Silicon	2.250 to 2.750	2.00 to 2.50	1.75 to 2.25	....	....
Phosphorus	less than .035	....	....	less than .025	less than .05
Sulphur	....	....	....	less than .035	less than .05
Manganese	less than 1.000	less than 1.00	less than 1.00	less than 1.000	less than 1.00

CUMBERLAND (Continued)

MOSS BAY HEMATITE IRON AND STEEL COMPANY, LTD., Workington. Brand, "Mosbay."

Could not obtain analysis of this iron.

NORTH WESTERN HEMATITE STEEL COMPANY, LTD., THE—Workington. Average output, 78,000 tons per year. Fuel, hard coke and Splint coal. Ores, local Cumberland hematite and best Spanish. Brand, "N. W. Co."

Bessemer.	No. 1.	No. 2.	No. 3.
Silicon	2.640	2.580	2.380
Phosphorus	.045	.040	.040
Sulphur	.026	.028	.038
Manganese	.490	.520	.520
Combined Carbon	.250	.280	.400
Graphitic Carbon	3.380	3.130	2.860

WHITEHAVEN HEMATITE IRON AND STEEL COMPANY, LTD., Cleator Moor, R. S. O. Brand, "Cleator" and "H. C. M."

Could not obtain analysis of this iron.

WORKINGTON HEMATITE IRON AND STEEL COMPANY, LTD., Workington. Brand, "Workington."

Could not obtain analysis of this iron.

DERBYSHIRE

BUTTERLEY COMPANY, LTD., Alfreton. Brand, "Butterley."

Could not obtain analysis of this iron.

CLAY CROSS COMPANY, near Chesterfield. Brands, "C x C" and "Clay Cross."

Could not obtain analysis of this iron.

DAVIS, E. P. Bennerley Furnace. Brand, "Awsworth."

Could not obtain analysis of this iron.

DENBY IRON AND COAL COMPANY, LTD., near Derby. Brands, "Denby Iron Co." and "D. D. D."

Could not obtain analysis of this iron.

DERBYSHIRE (Continued)

OAKES, JAMES AND COMPANY—Alfreton. Brand, "0 0 0 0."

Could not obtain analysis of this iron.

RENISHAW IRON COMPANY, Eckington, Sheffield. Brand, "Renishaw."

Could not obtain analysis of this iron.

SHEEPBRIDGE COAL AND IRON COMPANY, LTD., THE—Chesterfield. Fuel, coal and coke. Ores, Oolitic of Northamptonshire and Lincolnshire. Brand, "Sheepbridge."

	Foundry.
Silicon	3.00
Phosphorus	1.45
Sulphur	.03
Manganese	.75
Combined Carbon	.60
Graphitic Carbon	2.60

STANTON IRONWORKS COMPANY, LTD., Stanton Gate, Nottingham. Brand, "Stanton."

Could not obtain analysis of this iron.

STAVELEY COAL AND IRON COMPANY, LTD., near Chesterfield. Brand, "Staveley."

Could not obtain analysis of this iron.

DURHAM

BELL BROTHERS, LTD., Clarence Iron Works, Middlesbrough. Furnaces, built 12, blowing 10. Capacity, 320,000 tons per year. Fuel, coke. Ore, Cleveland ironstone. Brand, "Clarence."

	No 1.	No. 3.	No. 4 Foundry.	No. 4 Forge.	Mottled.	White.
Silicon	3.17	2.80	2.24	1.85	1.27	.88
Phosphorus.	1.60	1.57	1.54	1.56	1.51	1.57
Sulphur	.03	.03	.06	.10	.18	.28
Manganese	.50	.60	.52	.50	40	.38
Combined Carbon	.30	.30	.43	.55	1.65	3.10
Graphitic Carbon.	3.03	3.05	2.99	2.75	1.49	.10

CARLTON IRON COMPANY, LTD., Ferryhill. Brand, "Carlton."

Could not obtain analysis of this iron.

CONSETT IRON COMPANY, LTD., Blackhill, R. S. O. Brand, "Consett."

Could not obtain analysis of this iron.

DURHAM (Continued)

PALMERS SHIPBUILDING AND IRON COMPANY, LTD., Jarrow-on-Tyne. Stacks, 5 (4 in blast and 1 rebuilding). Capacity, 1 Cleveland furnace, 35,000 tons per year, and 3 hematite, each 46,000 tons per year. Fuel, coke. Ores, Spanish, Algerian and English Cleveland. Brands, "Jarrow" and "Tyneside."

	Jarrow Cleveland					Tyneside Hematite			
	No. 1.	No. 2.	No. 3.	No. 4 Foundry.	No. 4 Forge.	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	3.000	2.500	2.250	1.800	1.600	2.300	1.850	1.500	1.150
Phosphorus	1.100	1.100	1.100	1.150	1.200	.038	.038	.040	.040
Sulphur	.020	.032	.045	.065	.080	.025	.035	.055	.080
Manganese	.550	.550	.500	.400	.400	1.750	1.600	1.400	1.050
Combined Carbon	.100	.250	.300	.500	.560	.150	.270	.350	550
Graphitic Carbon	3.650	3.450	3.250	2.900	2.900	3.950	3.750	3.450	3.100

SEATON CAREW IRON COMPANY, LTD., THE—West Hartlepool. Capacity, 120,000 tons per year. Fuel, coke. Ores, Spanish and Algerian. Brands, "Seaton Carew" and "Seaton Basic."

	Ordinary.	Special.
Silicon	2.500	2.00
Phosphorus	.045	.03
Sulphur	.025	.01
Manganese	1.250	1.35
Combined Carbon	.450	.35
Graphitic Carbon	3.700	3.85

TEES-BRIDGE IRON COMPANY, LTD., THE—Stockton-on-Tees. Fuel, coke. Brand, "Tees-Bridge" (Cleveland quality.)

This iron is not sold by analysis.

WEARDALE IRON AND COAL COMPANY, LTD., Spennymoor. Brands, "Weardale," "Tudhoe" and "Hematite."

Could not obtain analysis of this iron.

WM. WHITWELL AND COMPANY, LTD., Thornaby Iron Works, Stockton-on-Tees. Stacks, 3. Total capacity, 125,000 tons per year. Fuel, coke. Brand, "Thornaby Hematite."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	2.50	2.40	2.00	1.50
Phosphorus	.04	.04	.04	.04
Sulphur	.02	.03	.05	.10
Manganese	1.00	.90	.80	.65
Combined Carbon	.10	.15	.30	.60
Graphitic Carbon	4.00	3.85	3.65	2.80

LANCASHIRE

BARROW HEMATITE STEEL COMPANY, LTD., Barrow-in-Furness. Brands, "B. H." and "B. H. S."

	No. 1.	No. 2.	White.
Silicon	2.942	2.750	.658
Phosphorus	.052	.063	.062
Sulphur	.050	.061	.348
Manganese	.537	.492	.076
Carbon	3.650	3.480	3.400

CARNFORTH HEMATITE IRON COMPANY, LTD., Carnforth. Brand, "Carnforth Hematite."

Could not obtain analysis of this iron.

DARWEN AND MOSTYN IRON COMPANY, LTD., Darwen. Brand, "Darwen."

Could not obtain analysis of this iron.

HARRISON, AINSLIE AND COMPANY, LTD., Ulverston. Brands, "Lorn" (cold blast) and "Backbarrow."

Could not obtain analysis of this iron.

MILLOM AND ASKAM HEMATITE IRON COMPANY, LTD., THE—Askam R. S. O. (Lancashire). Brands, "Millom Hematite," "Askam Hematite" and "M. H. M."

For further information see page 111.

NORTH LONSDALE IRON AND STEEL COMPANY, LTD., Ulverston. Brands, "Ulverston," "U. H. M.," and "U. V. C."

Could not obtain analysis of this iron.

WIGAN COAL AND IRON COMPANY, LTD., Wigan. Brands, "K. H.," "K. H. H." and "K. H. S."

Could not obtain analysis of this iron.

LEICESTERSHIRE

HOLWELL IRON COMPANY, LTD., Ashford by Melton Mowbray. Brand, "Holwell."

LINCOLNSHIRE.

APPLEBY IRON COMPANY, LTD., Frodingham. Brand, "Doncaster."

Could not obtain analysis of this iron.

FRODINGHAM IRON AND STEEL COMPANY, near Doncaster. Stacks, 1. Capacity, 75,000 tons per year. Fuel, South Yorkshire coke. Ore, Frodingham ironstone. Brand, "Frodingham."

Silicon	.50 to .70
Phosphorus	1.50 to 2.50
Sulphur	.05 to .07
Manganese	1.50 to 2.50

NORTH LINCOLNSHIRE IRON COMPANY, LTD., THE—Frodingham. Capacity, 86,000 tons per year. Fuel, coke. Brand, "N. L. B."

	No. 3.	No. 4. Forge.	Mottled.	White.
Silicon	2.090	1.670	.860	.70
Phosphorus	.950	1.100	.830	.80
Sulphur	.038	.046	.082	.13
Manganese	1.360	1.270	1.680	1.48
Graphitic Carbon	2.200	2.060	1.200	.80

REDBOURN HILL IRON AND COAL COMPANY, LTD., Doncaster. Brand, "Redbourn Allmine."

SHAKESPEARE, WM., Trent Iron Works, Scunthorpe. Capacity, 36,000 tons per year. Fuel, Yorkshire coke. Brand, "Trent."

	No. 3 Foundry.
Silicon	2.50
Phosphorus	1.30
Sulphur	.03
Manganese	1.80
Combined Carbon	.30
Graphitic Carbon	3.00

MONMOUTHSHIRE

BLAENAVON COMPANY, LTD., Blaenavon. Brand, "Blaenavon" (cold blast).

Could not obtain analysis of this iron.

EBBW VALE STEEL, IRON AND COAL COMPANY, LTD., THE—Ebbw Vale R. S. O. Ore, Bilbao Rubio. Brands, "Ebbw Valee" and "Victoria."

	Bessemer.			
	No. 1.	No. 2.	No. 3.	No. 4 Foundry.
Silicon	4.00	3.35	2.75	2.25
Phosphorus	.06	.06	.06	.06
Sulphur	.02	.05	.08	.12
Manganese	1.25	1.00	.95	.85
Combined Carbon	.17	.24	.35	.50
Graphitic Carbon	3.50	3.37	3.05	3.00

PATENT BOLT AND NUT COMPANY, LTD., Cwmbran, Newport. Brand, "P. N. B. Co."

Could not obtain analysis of this iron.

PYLE AND BLAINA WORKS, LTD., Blaina. Brand, "Star."

Could not obtain analysis of this iron.

RHYMNEY IRON COMPANY, LTD., Rhymney.

Could not obtain analysis of this iron.

TREDEGAR IRON AND COAL COMPANY, LTD., Tredegar. Brand, "Tredegar."

Could not obtain analysis of this iron.

NORTHAMPTONSHIRE

BUTLIN, THOS. AND COMPANY, LTD., Irthlingborough Iron Works, Wellingborough. Capacity, 48,000 tons per year. Fuel, coal and coke. Ore, brown hematite (a hydrated sesquioxide). Brand, "Butlin."

	No. 1.	Mottled.
Silicon	1.92	2.11
Phosphorus	1.19	1.07
Sulphur	.10	.13
Manganese	.24	.08
Graphitic Carbon	2.85	2.10

ISLIP IRON COMPANY, Finedon, Wellingborough. Brand, "Finedon."

Could not obtain analysis of this iron.

ISLIP IRON COMPANY, Thrapston. Brand, "Islip."

Could not obtain analysis of this iron.

KETTERING IRON AND COAL COMPANY, LTD., Kettering. Brand, "Kettering."

Could not obtain analysis of this iron.

NEW CRANSLEY IRON AND STEEL COMPANY, LTD., Kettering. Brand, "Cransley."

Could not obtain analysis of this iron.

PHIPPS, PICKERING (Exrs. of), Northampton. Brand, "Northampton."

Could not obtain analysis of this iron.

WELLINGBOROUGH IRON COMPANY, LTD., Wellingborough. Brand, "Rixons W'boro'."

Could not obtain analysis of this iron.

NORTHUMBERLAND

ARMSTRONG, SIR W. G., MITCHELL AND COMPANY, LTD., Newcastle-on-Tyne. Brand, "Ridsdale Hematite."

Silicon	2.100 to 2.40
Phosphorus	.035 to .04
Sulphur	.020 to .04
Manganese	1.024
Combined Carbon	.170 to .18
Graphitic Carbon	3.860

NOTTINGHAMSHIRE

BESTWOOD COAL AND IRON COMPANY, LTD., Bestwood, near Nottingham. Capacity, 80,000 tons per year. Fuel, Nottingham coal, with a little Derbyshire and Yorks coke. Brand, "Bestwood."

Silicon	2.70
Phosphorus	1.10
Sulphur	.04
Manganese	.40
Combined Carbon	.15
Graphitic Carbon	3.20

SHROPSHIRE

FOSTER, W. O., Madeley. Brand, "Madeley Court."

Could not obtain analysis of this iron.

LILLESHALL COMPANY, LTD., Shifnal. Capacity, 30,000 tons per year. Fuel, coke. Brands, "Lilleshall Lodge" (C. B.) and "Lilleshall H. B."

	Cold Blast.	Hot Blast.	Basic.
Silicon	.08 to 1.25	1.50	.45 to 1.00
Phosphorus	.50	.35 to .60	2.75
Sulphur	.06 to .10	.07	.06
Manganese	.60	1.00	1.50
Combined Carbon	.70	.60	.10
Graphitic Carbon	2.50	2.30	2.00

MADELEY WOOD COMPANY, near Ironbridge. Brand, "Madeley Wood Co."

Could not obtain analysis of this iron.

STAFFORDSHIRE, NORTH

BUTTERLEY COMPANY, LTD., Stoke-on-Trent. Brand, "W. S. S."

Could not obtain analysis of this iron.

CHATTERLEY-WHITFIELD COLLIERIES, LTD., Tunstall. Stacks, 3. Total capacity, 900 tons per week. Fuel, coal—Cockshead and Hardmine. Brand, "Chatterley."

	No. 4.
Silicon	1.350
Phosphorus	1.531
Sulphur	.046
Manganese	1.481
Combined Carbon	.695
Graphitic Carbon	2.153

GOLDENDALE IRON COMPANY, Tunstall and Stoke-on-Trent. Brand, "G. D. C."

Could not obtain analysis of this iron.

HEATH, ROBERT AND SONS, LTD., Tunstall and Stoke-on-Trent. Brands, "Heath & Sons" and "R. H. & S."

Could not obtain analysis of this iron.

MIDLAND COAL, COKE AND IRON COMPANY, LTD., Newcastle.

Could not obtain analysis of this iron.

SHELTON IRON, STEEL AND COAL COMPANY, LTD., Stoke-on-Trent. Brands, "Granville" and "Shelton."

Could not obtain analysis of this iron.

STAFFORD COAL AND IRON COMPANY, LTD., Stoke-on-Trent. Brand, "Fenton."

Could not obtain analysis of this iron.

STAFFORDSHIRE, SOUTH

BASSANO, W. AND COMPANY, Corngreaves, Birmingham. Brands, "Corngreav" (cold blast) and "Lion."

Could not obtain analysis of this iron.

BRADLEY, T. AND I. AND SONS, Darlaston. Brand, <> <>

Could not obtain analysis of this iron.

BRADLEY, THOS. AND ISAAC, LTD., Bilston. Brand, "Three Brands" (Round Pigs).

Could not obtain analysis of this iron.

EARL OF DUDLEY, THE—Brierley Hill. Brands, "L N F" (cold blast), "L N F–D U D," "L N F–XX" and "Coneygree."

Could not obtain analysis of this iron.

GRAZEBROOK, M. AND W., Netherton Iron Works, Dudley. Capacity, 6766 tons per year. Fuel, S. Staffs. thick coal, open hearth coked. Brand, "Grazebrook" (cold blast).

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	1.48	1.27	1.16	.83	.57
Phosphorus	.43	.34	.44	.31	.29
Sulphur	.03	.04	.05	.04	.06
Manganese	.96	.80	.94	.27	.13
Graphitic Carbon	3.07	3.04	3.12	3.03	2.81

HICKMAN, ALFRED, LTD., Wolverhampton. Brands, "B. F. M." and "S. V. H."

Could not obtain analysis of this iron.

HINGLEY, N. AND SONS, LTD., near Dudley. Brand, "Old Hill."

Could not obtain analysis of this iron.

PEARSON, JOSEPH H., Netherton Furnaces, East Worcestershire. Capacity, 22,000 tons per year. Fuel, native thick coal and S. Wales coke. Brands, "Netherton" and "Windmill End."

Could not obtain analysis of this iron.

STAFFORDSHIRE, SOUTH (Continued)

ROBERTS, WM., LTD., Tipton. Tipton Furnaces. Capacity, 60,000 tons per year. Fuel, hard coke. Brand, " Roberts Tipton Green."

Silicon	.75
Phosphorus	3.00
Sulphur	.07
Manganese	1.50

ROUND BROTHERS, Tividale, Tipton. Brands, "Round Tividale" and "Round Hange."

Could not obtain analysis of this iron

RUSSELL, JOHN AND COMPANY, LTD., Walsall. Brand, " B. Mine."

THOMAS, GEORGE AND RICHARD, Bloxwich, near Walsall. Brands, " G. & R. T. Special," " Hatherton," and " Wall End."

Could not obtain analysis of this iron.

WHITEHOUSE, H. B. AND SONS, Bilston. Brands, " Priorfield" and " Walbrook."

Could not obtain analysis of this iron.

WILLIAMS, PHILIP AND SONS, Wednesbury Oak Works, Tipton. Capacity, 7500 tons per year. Fuel, coke. Brand, "W. O." (cold blast).

Silicon	1.00
Phosphorus	.50
Sulphur	.08
Manganese	.56
Combined Carbon	.50
Graphitic Carbon	2.50

WILLINGSWORTH IRON COMPANY, THE—Wednesbury. Capacity, 20,000 tons per year. Fuel, local coal, S. Wales and Yorkshire coke. Brand, "Willingsworth."

Silicon	2.10
Phosphorus	3.53
Sulphur	.04
Manganese	1.00
Combined Carbon	.43
Graphitic Carbon	2.74

WILTSHIRE

WESTBURY IRON COMPANY, LTD., Westbury. Brand, "Westbury."

Could not obtain analysis of this iron.

WORCESTERSHIRE

COCHRANE AND COMPANY, Dudley Wood, Dudley. Brands, "Woodside" and "C. & C."

Could not obtain analysis of this iron.

YORKSHIRE

BOLCKOW, VAUGHAN AND COMPANY, LTD., Middlesbrough. Fuel, coke. Brands, "B-V," "S. B. Yorkshire," "Cleveland" and "Lackenby."

	B-V		
	No. 1.	No. 2.	No. 3.
Silicon	3.00	2.80	2.60
Phosphorus	.05	.05	.05
Sulphur	.03	.05	.06
Manganese	1.00	.95	.95
Combined Carbon	.10	.15	.20
Graphitic Carbon	3.00	3.30	3.25

BROWN, JOHN AND COMPANY, LTD., Sheffield. Capacity, 700 tons per week. Brand, "Atlas."

Could not obtain analysis of this iron.

CARGO FLEET IRON COMPANY, LTD., Middlesbrough. Brand, "Cargo Fleet."

	No. 3.
Silicon	2.54
Phosphorus	1.60
Sulphur	.02
Manganese	.66
Combined Carbon	.13
Graphitic Carbon	3.55

YORKSHIRE (Continued)

CARGO FLEET IRON COMPANY, LTD.

No. 3 CARGO FLEET.

YORKSHIRE (Continued)

CLAY LANE IRON COMPANY, LTD., South Bank, R. S. O. Brand, "Clay Lane."

	White.
Silicon	1.300
Phosphorus	1.530
Sulphur	.045
Manganese	.300
Combined Carbon	2.900
Graphitic Carbon	.100

WHITE CLAY LANE.

YORKSHIRE (Continued)

COCHRANE AND COMPANY, LTD., Middlesbrough. Brand, "Ormesby."

Could not obtain analysis of this iron.

COOKE, WILLIAM AND COMPANY, LTD., Sheffield. Brand, "Tinsley."

This Company's output is all used by themselves for the manufacture of bar iron.

FARNLEY IRON COMPANY, LTD., Leeds. Brand, "F. I. Co., Lim." (cold blast).

Could not obtain analysis of this iron.

GJERS, MILLS AND COMPANY, Middlesbrough. Brands, "H—Ayrsome, E, H" "Ayrsome" "FS—Ayrsome—FS" and "SS—Ayrsome—SS"

Could not obtain analysis of this iron.

LEEDS STEEL WORKS, LTD., THE—Hunslet, Leeds. Capacity, 105,000 tons per year. Fuel, Durham and Yorkshire cokes. Brand, "L. S. W." (Bessemer Basic Pig Iron.)

	Average analysis.
Silicon	.60
Phosphorus	2.60
Sulphur	.05
Manganese	1.75
Combined Carbon	2.85
Graphitic Carbon	Traces

LOWMOOR COMPANY, LTD., Bradford. Brand, "Lowmoor" (cold blast).

Could not obtain analysis of this iron.

NEWTON, CHAMBERS AND COMPANY, LTD., near Sheffield. Capacity, 26,000 tons per year. Fuel, coal and coke. Brand, "Thorncliffe."

	No. 1 Foundry.	No. 3 Foundry.
Silicon	3.10	2.59
Phosphorus	1.08	1.02
Sulphur	.04	.04
Manganese	.52	.59
Combined Carbon	Trace	.33
Graphitic Carbon	3.54	3.20

YORKSHIRE (Continued)

NORMANBY IRONWORKS COMPANY, LTD., Middlesbrough. Brands, "Normanby" and "N H. H."

Could not obtain analysis of this iron.

NORTH EASTERN STEEL COMPANY, LTD., Middlesbrough. Brands, "Acklam, Yorkshire," and "Acklam, Basic."

Could not obtain analysis of this iron.

PARK GATE IRON AND STEEL COMPANY, LTD., Rotherham. Brand, "P. G. Lincoln."

Could not obtain analysis of this iron.

SAMUELSON, SIR B. AND COMPANY, LTD., Middlesbrough. Brands, "B. S. Newport," "B. S. Hematite" and "B. S. Basic."

Could not obtain analysis of this iron.

SKINNINGROVE IRON COMPANY, LTD., Saltburn-by-the-Sea. Brand, "Skinningrove."

	No. 3.
Silicon	2.90
Phosphorus	1.50
Sulphur	.03
Manganese	.55
Combined Carbon	.08
Graphitic Carbon	3.05

YORKSHIRE (Continued)

WALKER, MAYNARD AND COMPANY, Redcar. Brand, "Redcar."

	No. 1.	No. 3.
Silicon	2.33	1.45
Phosphorus	1.56	1.67
Sulphur	.06	.07
Manganese	.71	.58
Combined Carbon	.28	.28
Graphitic Carbon	3.55	3.45

WEST YORKSHIRE IRON AND COAL COMPANY, LTD., Ardsley Junc., Leeds. Brand, "Leeds."

Could not obtain analysis of this iron.

WILLIAMS, EDWARD—Linthorpe Iron Works, Middlesbrough. Brands, "E. W. Hematite" and "Linthorpe."

Could not obtain analysis of this iron.

WILSONS, PEASE AND COMPANY, Middlesbrough. Brand, "G. W. L."

Could not obtain analysis of this iron.

YORK ROAD IRON COMPANY, THE—Leeds. (Cold blast).

This Company's output is all used by themselves.

SCOTLAND

AYRSHIRE

BAIRD, WM. AND COMPANY, LTD., Kilwinning. Fuel, raw coal. Brand, "Eglinton."

	Hematite			Foundry
	No. 1.	No. 3.	No. 4.	No. 3.
Silicon	3.000	2.38	1.50	2.38
Phosphorus	.040	.04	.04	.89
Sulphur	.034	.05	.08	.03
Manganese	.936	.72	.30	2.64
Combined Carbon	.440	.30	1.25	.48
Graphitic Carbon	3.000	3.00	2.00	2.81

DALMELLINGTON IRON COMPANY, LTD., Dalmellington (by Ayr). Brand, "Dalmellington."

	No. 1.
Silicon	2.93
Phosphorus	1.25
Sulphur	.03
Manganese	1.22
Combined Carbon	.63
Graphitic Carbon	2.80

GLENGARNOCK IRON AND STEEL COMPANY, LTD., THE—Glengarnock and Stevenston. Stacks, 12. Total capacity, 200,000 tons per year. Fuel, Splint coal. Brand, "Glengarnock."

	No. 1.	No. 3.
Silicon	3.25	2.50
Phosphorus	.60	.60
Sulphur	.04	.04
Manganese	1.50	1.50
Combined Carbon	.35	.45
Graphitic Carbon	3.30	2.80

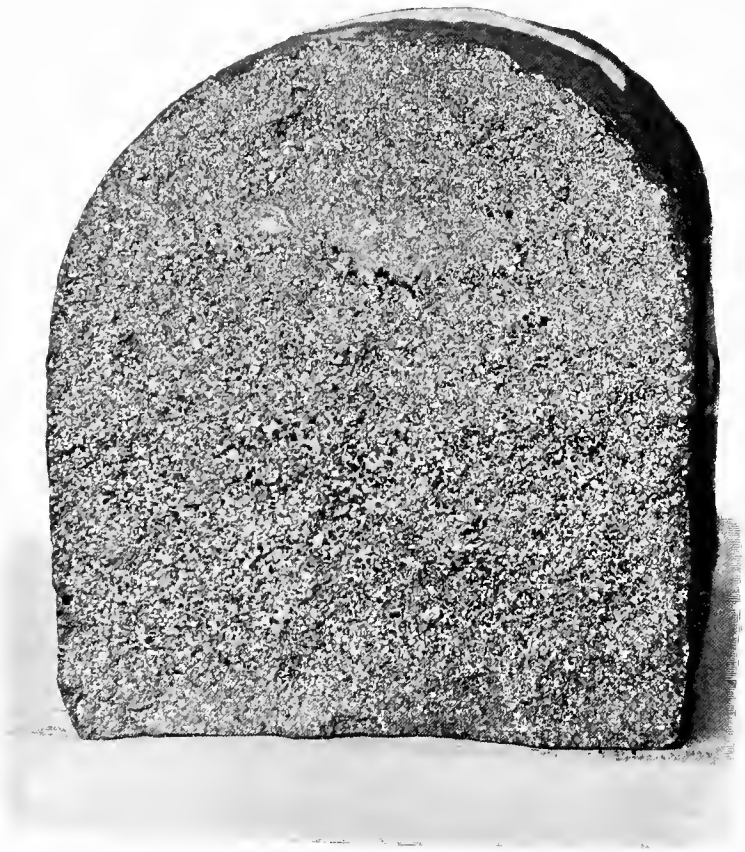
LANARKSHIRE

BAIRD, WM. AND COMPANY, LTD., Coatbridge. Fuel, raw coal. Brand, "Gartsherrie."

	Hematite			Foundry	
	No. 1.	No. 3.	No. 4.	No. 1.	No. 3.
Silicon	2.500	2.30	1.50	2.450	2.000
Phosphorus	.040	.04	.04	.750	.750
Sulphur	.015	.04	.08	.015	.035
Manganese	.340	.30	.30	1.150	1.100
Combined Carbon	.250	.50	1.25	.250	.500
Graphitic Carbon	3.150	2.95	2.00	3.100	2.850

LANARKSHIRE (Continued)

WM. BAIRD AND COMPANY, LTD.



No. 1 GARTSHERRIE.

LANARKSHIRE (Continued)

COLTNESS IRON COMPANY, LTD., Newmains, N. B. Brands, "Coltness" and "Coltness Hematite."

	No. 1 Coltness.
Silicon	3.430
Phosphorus	.984
Sulphur	.022
Manganese	1.580
Combined Carbon	.200
Graphitic Carbon	3.450

DIXON, WM., LTD., Coatbridge and Glasgow. Brands, "Calder," "Govan Hematite" and "Govan."

Could not obtain analysis of this iron.

DUNLOP, JAMES AND COMPANY, LTD., Tolcross, near Glasgow. Brand, "Clyde."

	No. 1.	No. 3.
Silicon	2.88	2.87
Phosphorus	.89	.92
Sulphur	.03	.03
Manganese	.62	.54
Combined Carbon	.30	.52
Graphitic Carbon	3.35	2.89

GLASGOW IRON AND STEEL COMPANY, LTD., Wishaw. Brand, "Wishaw."

Could not obtain analysis of this iron.

LANGLOAN IRONWORKS, Coatbridge. Brand, "Langloan."

Silicon	1.680
Phosphorus	.642
Sulphur	.021
Manganese	1.740
Combined Carbon	750
Graphitic Carbon	2.990

LANARKSHIRE (Continued)

MERRY AND CUNINGHAME, LTD., Coatbridge. Brands, "Carnbroe" and "M. and C."

	Carnbroe.
Silicon	2.93
Phosphorus	1.12
Sulphur	.03
Manganese	1.51
Combined Carbon	.76
Graphitic Carbon	2.90

SHOTTS IRON COMPANY, Shotts. Brand, "Shotts."

	No. 1.	No. 3.
Silicon	2.75	2.30
Phosphorus	.90	.82
Sulphur	Trace	.03
Manganese	1.00	1.10
Combined Carbon	.25	.35
Graphitic Carbon	3.50	2.90

SUMMERLEE AND MOSSEND IRON AND STEEL COMPANY, LTD., THE—Coatbridge. Brand, "Summerlee."

	No. 1.
Silicon	2.850
Phosphorus	.911
Sulphur	Trace
Manganese	1.080
Combined Carbon	.250
Graphitic Carbon	3.930

STIRLINGSHIRE

CARRON COMPANY, Carron, N. B. Fuel, coke. Ore, Scotch black bank ironstone. Brand, "Carron."

	No. 1.	No. 3 Special.	No. 3 Soft.	No. 3 Foundry.	No. 3 Close.	No. 3 Hard.
Silicon	2.800	2.275	2.650	2.150	1.750	1.570
Phosphorus	.880	.907	.902	.907	.905	.905
Sulphur	.035	.045	.038	.055	.050	.060
Manganese	1.450	1.450	1.400	1.311	1.420	1.450
Combined Carbon	.140	.250	.180	.200	.280	.290
Graphitic Carbon	3.500	3.370	3.280	3.350	3.170	3.160

WALES

CARMARTHENSHIRE

ANTHRACITE IRON AND STEEL COMPANY, LTD., near Kidwelly.

Could not obtain analysis of this iron.

DENBIGHSHIRE

BRYMBO STEEL COMPANY, LTD., Brymbo, Wrexham. Brand, "Brymbo."

Could not obtain analysis of this iron.

SPARROW, JAS. AND SON, near Wrexham. Fuel, coal. Capacity, 17,500 tons per year. Brand, "Ffrwd" (all mine).

	Grey Forge.	Foundry.
Silicon	2.56	3.26
Phosphorus	1.47	1.75
Sulphur	.05	Trace
Manganese	.43	.34
Combined Carbon	Trace	Trace
Graphitic Carbon	3.02	3.30

FLINTSHIRE

DARWEN AND MOSTYN IRON COMPANY, LTD., Mostyn. Brands, "Darwen" and "Mostyn."

Could not obtain analysis of this iron.

GLAMORGANSHIRE

BRITON FERRY WORKS, LTD., Briton Ferry. Brand, "Ferry."

Could not obtain analysis of this iron.

CEFN IRONWORKS, LTD., near Bridgend. Brand, "Mine."

CRAWSHAY BROTHERS, CYFARTHFA, LTD., Merthyr Tydfil. Brand, "Crawshay."

	Average analysis.
Silicon	2.80
Phosphorus	.05
Sulphur	.05
Carbon	3.50

DOWLAIS IRON COMPANY, Dowlais. Brands, "Dowlais" and "Dowlais Cardiff."

Could not obtain analysis of this iron.

FOREST IRON AND STEEL COMPANY, LTD., Treforest, R. S. O. Brand, "Forest."

NORTH'S NAVIGATION COLLIERIES, LTD., Tondu, near Bridgend.

Could not obtain analysis of this iron.

PYLE AND BLAINA WORKS, LTD., Pyle, near Bridgend. Brand, "Star."

Could not obtain analysis of this iron.

SWANSEA HEMATITE IRON COMPANY, LTD, Landore, R. S. O., Swansea. Brand, "Swansea Hematite."

WRIGHT, BUTLER AND COMPANY, LTD., Taibach, near Port Talbot. Brand, "Cwm Avon."

BELGIUM

ACOZ, BLAST FURNACES OF—Bouffioulx, Hainaut. Stacks, 1. Capacity, 27,000 tons per year. Fuel, coke. Ores, Oolitic and slag from rekindlings.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Total Carbon.
.25	1.30	.06	.20	2.70

ANGLEUR, STEEL WORKS OF—Tilleur, Liége. Stacks, 3. Total capacity, 125,000 tons per year. Fuel, coke. Ores, crushed ores from the Grand Duchy of Luxembourg, ores from Sweden and Spain and ores containing manganese from the East Indies.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
.50	2.10	.05	1.70	2.80	.50

ATHUS, BLAST FURNACES OF—Athus, Province of Luxembourg. Stacks, 2. Total capacity, 80,000 tons per year. Fuel, coke. Ore, Oolitic from the Grand Duchy of Luxembourg.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
.405	1.80	.27	.31	2.44	.....

BLAST FURNACES OF THE SOCIETY JOHN COCKERILL—Seraing, Liége. Stacks, 5. Total capacity, 172,000 tons per year. Fuel, coke and anthracite. Ores from Spain, Algeria, Greece, Sweden, Germany, Grand Duchy of Luxembourg, France, Belgium and sundry refuse.

CAST IRON, BESSEMER PROCESS.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
2.20	.05	.02	1.30	.40	3.15

REFINED CAST IRON.

.30	1.20	.20	.40	3.00	....

COUILLET IRON WORKS, Couillet and Châtelineau, Hainaut. Stacks, 2 each. Total capacity, 87,000 tons per year. Fuel, coke. Ores, crushed ores from Luxembourg, ores from Campine, clinkers from rolling mills and manganese ores from different countries.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Total Carbon.
.80	2.00	.10	2.00	3.00 to 3.50

BELGIUM (Continued)

GRIVEGNÉE IRON WORKS, Grivegnée, Liége. Stacks, 1. Capacity, 30,000 tons per year. Fuel, coke. Ores, from the Grand Duchy of Luxembourg.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
.40	1.80	.30	.....	3.50	...

HALANRY, BLAST FURNACES OF—Halanry, Province of Luxembourg. Stacks, 2. Total capacity, 45,000 tons per year. Fuel, coke. Ores, Oolitic from the Grand Duchy of Luxembourg.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
1.50 to 3.16	1.23 to 1.46	.004 to .031	.41 to .62	.15 to .40	2.55 to 3.67

HOURPES SUR SAMBRE IRON WORKS, Thuin, Hainaut. Stacks, 2. Total capacity, 44,000 tons per year. Fuel, coke. Ores, crushed ores from Luxembourg and ores from Meurthe and Moselle.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Total Carbon.
46 to .70	1.11 to 1.39	.40 to .49	.20 to .26	2.90 to 3.05

LA LOUVIÈRE, BLAST FURNACES AND SMELTING WORKS OF—La Louvière, Hainaut. Stacks, 1. Capacity, 25,000 tons per year. Fuel, coke. Ores, Oolitic from the Grand Duchy of Luxembourg.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
40 to .70	1.75 to 2.10	.40 to .50	.....	2.90 to 3.40	.. ...

L'ESPÉRANCE LONGDOZ IRON WORKS, Seraing, Liége. Stacks, 2. Total capacity, 64,000 tons per year. Fuel, coke.

Could not obtain analysis of this iron.

MONCEAU SUR SAMBRE IRON WORKS, Monceau sur Sambre, Hainaut. Stacks, 2. Total capacity, 65,000 tons per year. Fuel, coke Ores, clinkers from puddling ovens, crushed ores from Luxembourg and the east of France (Nancy).

Silicon.	Phosphorus.	Sulphur.	Manganese.	Total Carbon.
.40 to .80	1.25 to 1.80	.10 to .25	. ....	2.60 to 3.25

BELGIUM (Continued)

MUSSON COMPANY, LTD., BLAST FURNACES, FOUNDRIES AND MINES OF—Musson, Province of Luxembourg. Capacity, 42,000 tons per year. Fuel, coke. Ore, Oolitic. Brand, "S. M."

	No. 3.	No. 5.	No. 7.
Silicon	2.97	2.10	1.15
Phosphorus	1.42	1.75	1.90
Sulphur	.03	.04	.08
Manganese	.66	.66	.66
Combined Carbon	.14	.55	.75
Graphitic Carbon	3.80	2.84	2.37

OUGRÉE IRON WORKS, Ougrée, Liége. Stacks, 3. Total capacity, 74,000 tons per year. Fuel, coke.

Could not obtain analysis of this iron.

PROVIDENCE IRON WORKS, Marchienne-au-Pont, Hainaut. Stacks, 3. Total capacity, 98,000 tons per year. Fuel, coke. Ores, crushed ores from Luxembourg, ores from Meurthe and Moselle, ores from Campine and Sweden, refuse from puddlings and manganese ores from different districts.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Total Carbon.
.05	2.50	.06	1.50	3.50

SOUTH CHÂTELINEAU, BLAST FURNACES OF—Châtelineau, Hainaut. Stacks, 1. Capacity, 33,000 tons per year. Fuel, coke. Ores, Oolitic crushed ore from the Grand Duchy of Luxembourg, clinkers from rekindlings, residue of pyrites and ores from Sweden.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
.....	1.40 to 1.50	.20 to .30	.00 to .10	2.90 to 3.30	.....

THY LE CHÂTEAU, BLAST FURNACES AND STEEL WORKS OF—Marcinelle, Hainaut. Stacks, 2. Total capacity, 31,000 tons per year. Fuel, coke. Ores from Luxembourg and Lorraine, and ores containing manganese from Caucase.

Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
.05	2.20	.05	1.80	3.20	.20

CANADA

NOVA SCOTIA

BRIDGEVILLE FURNACE, Bridgeville, Pictou County. Stacks, 1. Capacity, 7300 tons per year. Fuel, coke and charcoal. Ores, iron and manganese.

Could not obtain analysis of this iron.

LONDONDERRY IRON COMPANY, LTD., THE—Acadia Iron Mines (near Londonderry), Colchester County. Stacks, 2. Total capacity, 40,000 tons per year. Fuel, coke. Ores, limonite, carbonate and red hematite. Brand, "Siemens."

	No. 1.	No. 2.	No. 3.	No. 4.
Silicon	3.44	3.64	3.73	3.32
Phosphorus	.49	.46	1.13	.84

NOVA SCOTIA STEEL COMPANY, LTD., Ferrona, Pictou County. Stacks, 1. Capacity, 32,000 tons per year. Fuel, coke. Ores, local brown and red hematite and Newfoundland. Brand, "Ferrona."

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	No. 4 Foundry.	Basic.	Hematite.	No. 1 Soft Foundry.	No. 2 Soft Foundry.
Silicon	2.85	2.40	2.150	2.00	.65	1.00	3.75	3.40
Phosphorus	1.00	1.00	1.000	1.00	1.00	.10	1.10	1.10
Sulphur	.02	.02	.025	.04	.03	.04	.01	.01
Manganese	.60	.60	.650	.75	1.25	1.75	.60	.60
Combined Carbon	.15	.25	.580	.85	.91	.80	.16	.28
Graphitic Carbon	3.68	3.35	3.000	2.65	3.15	3.08	3.50	3.35

Mottled and white iron are off grades.

ONTARIO

DESERONTO IRON COMPANY, LTD., Deseronto. Deseronto Furnace. Stacks, 1. Capacity, 12,000 tons per year. Fuel, charcoal. Ores, American from Lake Superior and local Canadian.

Could not obtain analysis of this iron.

HAMILTON BLAST FURNACE COMPANY, LTD., THE—Hamilton, Wentworth County. Hamilton Furnace. Stacks, 1 Capacity, 50,000 tons per year. Fuel, coke. Ores, hematite and magnetic. Brand, "Hamilton."

Could not obtain analysis of this iron.

QUEBEC

CANADA IRON FURNACE COMPANY, LTD., Radnor Forges, Champlain County. Stacks, 1. Capacity, 10,000 tons per year. Fuel, charcoal. Ores, lake and bog. Brand, "C. I. F."

Could not obtain analysis of this iron.

MCDOUGALL, JOHN AND COMPANY, Drummondville, Drummond County. Stacks, Grantham Furnace, 1; St. Francis Furnace, 1. Total capacity, 4000 tons per year. Fuel, charcoal. Ore, local limonite.

Could not obtain analysis of this iron.

CANADA (Continued)

The output of pig iron in Canada for the past quarter of a century is shown by the following table:

	Tons.
1875	4,000
1876	4,000
1877	13,500
1878	16,000
1879	16,500
1880	23,000
1881	18,500
1882	21,500
1883	32,000
1884	29,389
1885	25,770
1886	26,160
1887	39,717
1888	22,209
1889	24,823
1890	25,697
1891	20,153
1892	30,294
1893	46,948
1894	62,522
1895	31,692
1896	32,052
1897	33,254
1898	75,922
1899	100,706

The figures for the last two years are for calendar, and all others for fiscal years.

There were in blast in Canada last year four furnaces, and their respective pig iron output, compared with that of 1898, was as follows:

	1899. Tons net.	1898. Tons net.
Hamilton Blast Furnace Co	51,580	48,253
Nova Scotia Steel Co	31,010	21,627
Canada Iron Furnace Co	6,500	6,042
Deseronto Iron Co	11,616	..
Total	100,706	75,922

The Deseronto Furnace was not put into blast until January, 1899. The output of the Canada Iron Furnace Company, Radnor Forges, and of the Deseronto Iron Company, Deseronto, Ont., is charcoal pig, and that of the Hamilton Blast Furnace Company, Hamilton, Ont., and of the Nova Scotia Steel Company, New Glasgow, N. S., of the coke description.

DENMARK

Under date of April 28, 1900, the United States Consulate at Copenhagen writes as follows:

"There is in the Baltic Sea an island of Denmark called Barkholm, and some years ago an iron mine was worked there, but the quantity of ore was not large nor the quality good, and the mine is no longer worked. Elsewhere in Denmark, so far as I can learn, there is no iron ore, nor is iron ore from other countries treated in Denmark."

FRANCE

Annual production of Pig Iron for the year 1899:

Fuel.	Tons.
Coke	2,542,583
Wood	13,762
Mixed	11,043
Total	2,567,388

	Silicon.	Phosphorus.	Sulphur.	Manganese.	Combined Carbon.	Graphitic Carbon.
Black Pig Iron of Garsthevrie,	2.271	0.842	1.267	2.401	1.347	3.156
Grey Pig Iron,	3.265	0.459	0.036	0.388	0.086	2.171
					Total Carbon.	
White Pig Iron, Swedish,	0.771	0.327	.....	4.491	4.749	
" " " Westphalia,	0.476	2.600	0.062	1.131	3.267	
" " " Oboukow,	1.300	0.070	0.060	0.390	4.480	

GERMANY

BLAST FURNACES

UPPER SILESIA.

Borsigwerk near Borsigwerk, O. S.
Donnersmarckhütte near Zabrze.
Friedenshütte near Friedenshütte.
Julienshütte near Bobrek.
Königl. Hütte, Gleiwitz.
Bethlen–Falvahütte near Schwientochlowitz.
Vereinigte Königs und Laurahütte, Berlin, W.
Hubertushütte near Ober–Lagiewnik.
Redenhütte near Zaborze.
Tarnowitzerhütte near Tarnowitz.

WURTEMBERG.

Wasseralfingen, Kgl. Würtemberg Hüttenamt.

BAVARIA.

Amberger Hochöfen, Amberg.
Maximilianshütte, Rosenberg Ober–Pfalz.

THURINGIA, HARZ, BRUNSWICK, HANOVER.

Maximilianshütte, Unterwellenbarn Kr. Saalfeld.
Harzer Werke zu Rübeland und Zorge, Blankenburg.
Rothenhütte near Elbingerode a. H.
Mathildenhütte, Neustadt. Harzburg.
Eisenwerk Carlshütte, Delligsen near Alfeld.
Ilseder Hütte, Gross Ilselde.

WESTPHALIA—LOWER RHINE DISTRICT.

Georgs–Marienhütte, Osnabruck.
Ablerbecker Hütte, Ablerbeck.
Carl von Born, Dortmund.
Hörder Verein, Hörde.
Union Act. Ges. Dortmund.
" " " Hattingen.
" " " Steele.
Eisen & Stahlwerk Hoesch, Dortmund.
Schalker Gruben & Hüttenverein, Gelsenkirchen.
Bochumer Verein, Bochum.
Fried. Krupp, Essen.
Friedr. Wilh. Hütte, Mülheim, Ruhr.
Gutehoffnungshütte, Oberhausen, Rheinl.
Phönix Act. Ges. Kupferdreh.
" " " Borbeck.
" " " Laar near Ruhrort.
Rheinische Stahlwerkem Ruhrort.
Gewerkschaft Deutscher Kaiser, Bruckhausen, Rheinl.
Niederrheinische Hütte, Duisburg, Hochfeld.
Act. Ges. Vulcan, Duisburg, Hochfeld.
Bergischer Gruben u. Hütten Verein, Hochdahl.
Eschweiler–Bergwerksverein, Eschweiler, Pumpe.
Act. Verein Johanneshütte, Siegen (Siegerland).

GERMANY (Continued)

MIDDLE RHINE DISTRICT.

Gew. Carl Otts, Cologne.
Sieg–Rhein. Hütten Act. Ges. Friedr. Wilhelm Hütte.
Gebr. Lossen, Concordiahütte, near Bendorf.

SIEGERLAND.

Finnentroper Hütte, Finnentrop i. W.
Gabriel Bergenthal & Co., Germaniahütte.
Bremerhütte, Geisweid.
Birlenbacher Hüttegewerkschaft, Birlenbacherhütte.
Haardter Hütten Gewerkschaft, Berg & Co. Hardt a. d. Sieg.
Geisweider Eisenwerk, Geisweidö.
Act. Ges. Rolandshütte near Siegen.
Hainer–Hütte, Siegen.
Gewerkschaft Marienhütte, Eiserfeld near Siegen.
Eiserfelder Hüttengewerkschaft, Eiserfeld.
Eiserner Hüttengewerkschaft, Eisern.
Act. Ges. Charlottenhütte, Niederschelden.
Brachbacher Hochofengew. Schulte Weber & Co. Brachbach.
Carl von Wittigstein, Friedrichshütte near Laasphe.
Act. Ges. Wissener Bergwerke & Hütten, Brückhöfe.
Act. Ges. Heinrichshütte, Heinrichshütte near Au.
Cöln Müsener Bergwerks. Actien-Verein, Creuzthal.
Gosenbacher Hüttengewerkschaft Gosenbach.
Gewerkschaft der Neu Grünebacher Hütte Grünbach.
Gewerkschaft Herdorfer Hütte Herdorf.
Gewerkschaft Seelenbergerhütte, Herdorf.

DILL–LAHN (NASSAU).

Buderussche Eisenwerke, Wetzlar.
Eisenwerke Hirzenhain & Lollar, Lollar.

SAAR.

Burbacherhütte near Saarbrücken.
Gebr. Rochling, Völklingen.
Gebr. Stumm, Neunkirchen.
Halbengerhütte, Brebach.

LORRAINE.

Lothringen Eisenwerke, Ars a. d. Mosel.
Societé anonyme de Aciéres d'Angleur Hauts-Fourneaux d'Audin le Tiche, Deutsch Oth de Wendel & Co. Harjingen, Loth.
Dillinger Hüttenwerke, Dillingen Saar.
Rümelinger Hüttengesellschaft, Oettingen.
W. Lamarche & Co. Meziéres.
Rombacher Hüttenwerke, Rombach.
Gebr. Stumm, Ueckingen.

LUXEMBURG.

Gebr Collart. Steinfort.
Hochofen Act. Ges. Rodringen.
Metz & Co. Eich.
Hüttengesellschaft, Rümelingen.
Eisenhütten Actien-Verein, Düdelingen.
Aachener Hütten Actien-Verein, Esch.

GERMANY (Continued)

It has been impossible to obtain analyses of the pig iron made in this country direct from the furnaces, but Mr. Frank H. Mason, Consul-General at Berlin gives the following information under date of December 19, 1899, showing analyses of Standard German grades of pig iron furnished by Mr F. D. Carney, chemist.

Class of Pig Iron	Analysis of Typical Irons.							
	Silicon.	Phos.	Mn.	Sulphur.	Graphite.	Comb. Carbon.	Ores.	Fuel.
Forge Iron ..... Used in puddling furnaces for manufacture of wrought iron. Also used to a limited extent for mixing with grey foundry irons to make strong castings.	0.50	1.10	0.42	0.12	0.22	2.60	Mixture of German and Foreign ores.	All fuel coke made in retort ovens from native bituminous coals.
Basic Bessemer Iron..... Used for manufacture of basic bessemer steel.	1.25	2.15	0.43	0.05	0.90	2.00	Native Ores.	
Acid Bessemer Iron..... Used for acid bessemer and acid open hearth steel manufacture.	2.40	0.05	1.10	0.03	3.20	0.60	Mixture of Swedish and Spanish ores.	
Foundry Iron .... Used for iron castings—The German furnaces try to make a foundry No.1 iron that will make good castings by mixing with the English and Luxemburg high phosphorus No. 3 pig iron—[Note Low Phosphorus.]	3.00	0.30	0.60	0.04	3.25	0.50	Mixture of Spanish and Native ores.	

The German blast furnaces are mostly small, producing about 150 tons every 24 hours. They are, however, beginning to build larger furnaces after the American plan.

JAPAN

Annual Production of Pig Iron in Japan for the year 1899:

Charcoal	20,000 tons
Coke	10,000 tons
Total,	30,000 tons

Name and Location of Blast Furnaces:

IMPERIAL STEEL WORKS in Yahata Mura, Chikuzen.

TANAKA IRON WORKS in Kamaishi, Rikuchiu.

HAYASHI IRON WORKS in Mayuki, Hiuga.

IRON WORKS in Nakaosaka, Kohdzuke.

TANAKA IRON WORKS. Kamaishi, Rikuchiu. Fuel, charcoal. Ores, magnetite and hematite.

	No. 1.	No. 2.	No. 3.
Silicon	.870	.710	.570
Phosphorus	.056	.061	.043
Sulphur	.008	.012	.010
Manganese	.770	.760	.620
Combined Carbon	.680	.980	1.880
Graphitic Carbon	2.460	2.050	1.310

Fuel, coke.

Silicon	1.940
Phosphorus	.072
Sulphur	.033
Manganese	.850
Combined Carbon	.380
Graphitic Carbon	3.480

A Government iron works is in course of construction and will be completed in 1901. It is expected to produce annually 120,000 tons of Pig Iron. The Tanaka Iron Works is contemplating enlarging their business next year and the yearly increase in the production will be about 8000 tons. Thus, Japan will produce annually about 160,000 tons after 1901.

MEXICO

It has been impossible to obtain analyses from any of the furnaces in Mexico, but the following are the names of companies making Pig Iron:

THE DURANGO IRON WORKS, Durango.

MEXICAN NATIONAL IRON AND STEEL COMPANY, City of Mexico.

MANUEL L. CORCUERA, Guadalajara.

MANUEL AIZPURU, Guadalajara.

LA GLISE & SONS, Toluca.

FRANCISCA BARRIGA & CO., City of Oaxaca.

FRANCISCO QUIJANO, City of Oaxaca.

GUSTAVO STEIN, Tlaxiaco, Oaxaca.

RUSSIA

The following names of companies making pig iron have been furnished by United States Consul-General Holloway, at St. Petersburg:

Alexandrovski Steel Foundry Company, Admiralty Quay, 8-1.

Putilovski Works, Karavannaia, 9.

Nevski Mechanical Works, Shlisselburg Road, 1-8.

Verchne-Isetski Works, Vassili Ostrov, Tutchkov Quay, 18.

Maltztovski Works, Voznesenski, 6.

St. Petersburg Metallic Works, Poliustrovski Quay, 19.

Donetzki Iron and Steel Works, Konnogvardeiski Square, 11.

W. Kollan (late Arthur Du-Rietz), Vassili Ostrov, 18 Line, 15-52.

We have been unable to receive an analysis of the iron made by each furnace, but we have received the general information that they use timber, coal, coke and petroleum for fuel, that the principal ores used in producing pig iron are magnetic, brown iron, red hematite, siderite and clay ironstone, and the following is an average analysis of the iron made in this country:

Silicon	.7600
Phosphorus	.1580
Sulphur	.0052
Manganese	.3720
Combined Carbon	.5070
Graphitic Carbon	3.2890

RUSSIA (Continued)

PRODUCTION OF PIG IRON IN ALL OF RUSSIA BY PRIVATE AS WELL AS GOVERNMENT WORKS.

	Years				Six Months of
	1895.	1896.	1897.	1898.	1899.
			English Tons		
SOUTH, 17 Private Works	542,903	628,675	744,540	986,468	620,575
URAL, 93 Private Works.....	471,098	510,953	579,997	621,778	340,450
" 13 Government Works.....	64,907	60,688	78,035	80,150	46,013
" Total	536,005	571,641	658,032	701,928	386,463
POLAND, 37 Private Works.....	181,607	210,594	220,892	255,633	144,030
" 4 Government Works.....	5,180	5,308	3,867	3,443	1,764
" Total	186,787	215,902	224,759	259,076	145,794
MOSCOW REGION, 46 Private Works..	123,820	132,630	166,884	177,598	129,398
NORTH, 9 Private Works.....	689	748	1,734	22,678	13,446
" 4 Government Works.....	2,173	4,019	3,073	3 305	2,402
" Total.....	2,862	4,767	4,807	25,983	15,848
SOUTHWESTERN, 5 Private Works..	3,482	3,376	2,706	3,002	1,473
SIBERIA, 3 Private Works.....	5,526	5,526	7,975	8,687	2,407
IN ALL, 212 Private Works.....	1,329,125	1,492,502	1,724,728	2,075,844	1,251,679
" 21 Government Works	72,260	70,015	84,975	86,898	50,179
" 233 Private and Government Works	1,401,385	1,562,517	1,809,703	2,162,742	1,301,858
H. I. M. Private Property and Finnish Works.....	25,964	24,722	24,722	23,944	12,897
Grand Total of all Works in the Empire.	1,427,349	1,587,239	1,834,425	2,186,686	1,314,755

SPAIN

Under date of May 7, 1900, Wm. D. Marvel, of Madrid, writes as follows:

"Your letter of the 11th of April to U. S. Consulate of Spain was referred to me. I do not know of any blast furnaces within the district of Madrid. In the north, at Bilbao, there are several furnaces. * * * *

"There is a new furnace building on the east coast between Abiante and Barcelona, intending to use local ores, and local coal as fuel, which they claim cokes well.

* * * * * *

"I may say to you that the pig iron made at the Bilbao furnaces is of excellent quality for some of the best work demanded in these times, though the ores in that region by reason of the enormous demands, are being very rapidly exhausted, and the future of the region is a serious problem."

* * * * * *

SWEDEN

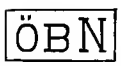
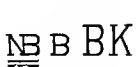
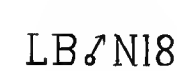
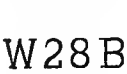
The following information has been furnished by Mess. Joh. Sam. Billing & Son, Stockholm.

Annual production of Pig Iron, about	500,000 Tons
" exportation " "	75,000 to 100,000 "
Number of Furnaces in Sweden	171

DIFFERENT KINDS OF PIG IRON PRODUCED IN THE YEAR 1898.

For Siemens—Martin and Bessemer purposes	240,781	Tons
" Puddling and Lancashire purposes	259,971	"
" Spiegel Iron purposes	2,246	"
" Malleable purposes	10,643	"
" Casting "	10,309	"
Total	523,950	"

SWEDEN (Continued)

Brand	Silicon	Phosphorus	Sulphur	Manganese	Combined Carbon	Graphitic Carbon	
	....	.016	.010	....	....	....	
	.18	.013	.010	1.20	....	....	
	.28	.019	.008	.78	. .	....	
	.60	.019	.010	1.00	....	....	
	.76	.020	.008	1.76	4.30	....	
	....	.019	.007	1.00	....	....	
	1.22	.021	.010	1.88	....	....	
	.22	.017	.010	1.09	....	....	White
	1.09	.019	.015	2.10	....	....	
	1.29	.027	.015	3.33	1.65	2.40	
	1.20	.033	.008	2.94	....	....	
	1.00	.025	.015	2.50	....	....	
	.53	.035	.010	1.00	....	....	
	1.69	.047	.015	.98	.30	3.47	
	.50	.050	.015	.25	....	....	
	.54	.060	.008	.28	....	....	
	.51	.058	.015	.12	....	....	
	....	.045	.012	....	....	....	
	.23	.064	.005	16.93	4.76	....	Spiegeleisen

CHINA

Under date of December 5, 1899, the Chinese Consulate-General at San Francisco states that this country has not developed her mineral resources yet to any extent.

PORTUGAL

Under date of May 2, 1900, the United States Consulate at Lisbon states that no pig iron furnaces exist in this country.

SWITZERLAND

Under date of December 2, 1899, the United States Consulate at Berne states that pig iron is not manufactured in this country, as there is no ore there.

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315 Howard St., San Francisco.

Dear Sir:—In response to your request, it gives us much gratification to state that your "F. P. Metal" was the only bearing metal used in all the engines on the U. S. Battleship "OREGON," and the results of its use were most highly satisfactory, not only upon the ship while in our hands, but we understand that the metal has continued to give the same high satisfaction ever since.

Very truly yours,
UNION IRON WORKS,
By J. O'B. GUNN, Secretary.

PIG IRON

AND

Alabama Foundry Coke

ROGERS, BROWN & CO.
CINCINNATI, OHIO

SEYMOUR R. CHURCH
...AGENT...
307 SANSOME STREET
San Francisco, California
... Telephone Main 5086

For the convenience of users of Pig Iron on the Pacific Coast, we have secured the Agency of a large number of different brands of Pig Iron. The list given below represents the American Irons which we are agents for. From this list can be selected Iron which will produce any kind of casting that can be made any place in the world. This means that we carry the Iron in stock in San Francisco and buyers do not have to wait to get quick delivery. We will take pleasure in furnishing our customers with the analysis of any of the Irons in this list, thus enabling Foundrymen to make intelligent mixtures.

BRAND	STACKS	LOCATION	ORES USED	FUEL	YEARLY CAPACITY TONS
Niagara	1	N. Tonawanda, Niagara Co., N. Y.	Hematite and Specular from Lake Superior	Coke	165,000
Tonawanda	1	N. Tonawanda, Niagara Co., N. Y.	Hematite and Specular from Lake Superior	Coke	
Oxford	1	Oxford, Warren Co., N. J.	Local magnetic	Anthracite coal	30,000
Crane	4	Catasauqua, Lehigh Co., Pa.	Lake Superior, Port Henry and Chataguay	Anth. coal & coke	135,000
Henry Clay	2	Reading, Berks Co., Pa	Very rich fossil	Anth. coal & coke	36,000
Topton	1	Topton, Berks Co., Pa.	Lake Superior	Anth. coal & coke	30,000
Bellefonte	1	Bellefonte, Centre Co, Pa.	Native hematite	Coke	45,000
Nittany	1	Bellefonte, Centre Co, Pa.	Lake Superior and native brown	Coke	40,000
Charlotte	1	Scottdale, Westmoreland Co., Pa.	Lake Superior	Coke	70,000
Punxy	1	Punxsutawney, Jefferson Co., Pa.	Lake Superior, hematite and Specular	Coke	85,000
Macungie	1	Macungie, Lehigh Co., Pa.	Native hematite	Anth. coal & coke	20,000
Dunbar	2	Dunbar, Fayette Co., Pa	Native, Lake Superior Bessemer and Specular	Coke	100,000
Bristol	1	Bristol, Va.-Tenn	Brown hematite and fossil	Coke	45,000
Gem	1	Shenandoah, Page Co., Va.	Local brown hematite	Coke	36,000
Victoria	1	Goshen, Rockbridge Co., Va	Native brown (limonites)	Coke	50,000
Boone	1	Paducah, McCracken Co., Ky.	Local brown hematite	Coke	30,000
Watts	2	Middlesborough, Bell Co. Ky	Fossil and hematites	Coke	75,000
Carnegie	1	Johnson City, Washington Co., Tenn.	Cranberry	Coke	45,000
Embreville	1	Embreville, Washington Co., Tenn	Local brown hematite	Coke	45,000
Napier	1	Napier, Lewis Co., Tenn	Local brown hematite	Coke	30,000
Mannie	2	Mannie, Wayne Co., Tenn	Local brown hematite	Charcoal	36,000
Greensboro	1	Greensboro, Guilford Co., N. C	Local magnetic and limonite	Coke	35,000
Cherokee	1	Cedartown, Polk Co., Ga	Red and brown hematite	Charcoal & coke	27,000
Rome	1	Rome, Floyd Co., Ga.	Local brown hematite	Charcoal	15,000
Talladega	1	Talladega, Talladega Co., Ala.	Local brown hematite	Coke	40,000
Trussville	1	Trussville, Jefferson Co., Ala.	Red and brown hematite	Coke	30,000
Williamson	1	Birmingham, Jefferson Co. Ala	Red and brown hematite	Coke	18,000
Pioneer	2	Thomas, Jefferson Co., Ala	Red and brown hematite	Coke	95,000
Vanderbilt	1	Birmingham, Jefferson Co., Ala	Red fossil and brown hematite	Coke	36,000
Attalla	1	Attalla, Etowah Co., Ala	Red and brown hematite	Charcoal	18,000
Jefferson	1	Jefferson, Marion Co, Tex	Local brown, fossiliferous and carbonate	Charcoal	13,500
River	1	Cleveland, Cuyahoga Co., O.	Lake Superior	Coke	72,000
Belfont	1	Ironton, Lawrence Co., O.	Lake Superior and native	Coke	50,000
Anchor	1	Oak Hill, Jackson Co., O	Native	Charcoal	5,000
Globe	1	Jackson, Jackson Co., O	Native	Coke & coal	7,500
Star	1	Jackson, Jackson Co., O	Native	Coke	18,000
Wellston	3	Wellston, Jackson Co., O	Local and Lake Superior	Coke	60,000
Hecla	1	Hecla P. O., Lawrence Co., O	L. S. and Hanging Rock limestone	Charcoal and coke	9,000
Madison	1	Rempel, Jackson Co., O.	Lake Superior	Coke	5,000
Olive	1	Olive P. O., Lawrence Co., O.	Native limestone	Charcoal	5,000
Vesuvius	1	Pedro, Lawrence Co., O.	Native limestone	Charcoal	3,000
Iroquois	1	Chicago, Cook Co., Ill.	Lake Superior	Coke	80,000
Hinkle	1	Ashland, Ashland Co., Wis.	Gogebic	Charcoal	45,000
Sallsbury	1	Chatham, Columbia Co, N. Y.	Roasted carbonate from Amenia, New York, and Kelley, Amenia, and Shaker hematites	Charcoal	5,000
Carbonate	1	Chapinville, Litchfield Co., Conn.	Roasted carbonate from Amenia, New York, and Kelley, Amenia, and Shaker hematites	Charcoal	4,500
Total	55				Total 1,844,500

Fresh Snowballs *(the kind that do not melt) always on hand*
Also all other brands of English Fire Brick

FOR SALE BY S. R. CHURCH

A complete stock of Gautier's Crucibles stored in San Francisco ready for immediate delivery

A Few Facts Regarding J. H. Gautier & Co.

Mr. Dudley S. Gregory and associates about 1847 established in Jersey City the Adirondack Steel Company. At that time Joseph Dixon came to Jersey City and said he could make black lead crucibles for steel melting. Mr. Gregory suggested to his son-in-law, Dr. J. H. Gantier, that he go into the business. This led to the establishing of J. Dixon & Co., Jersey City, and J. H. Gantier remained actively at the head of the business until 1857 when he erected the works which have ever since been occupied by J. H. Gantier & Co., Dr. Gautier remaining as its head until his death in 1895. Mr. C. E. Gregory, the President of J. H. Gantier & Co., has been connected with the business since its commencement March, 1858, and Mr. David R. Daly, the Vice-President and General Manager, since 1864.

PLUMBAGO

CRUCIBLES FOR MELTING

BRASS
STEEL
GOLD
SILVER
AND OTHER METALS

PLUMBAGO RETORTS,

DIPPERS, STIRRERS, Etc., Etc.

PLUMBAGO PRODUCTS

FINELY POWDERED PURE CEYLON

PLUMBAGO FOR VARIOUS PURPOSES

J. H. GAUTIER & CO.

JERSEY CITY, NEW JERSEY

S. R. CHURCH

AGENT FOR THE PACIFIC COAST

307 SANSOME STREET SAN FRANCISCO, CAL.

ESTABLISHED 1849

MACONDRAY & CO.

IMPORTING

Shipping and Commission Merchants

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MACONDRAY & CO.
MANILA

MACONDRAY & CO.
Nos. 9 and 11 Fenchurch Ave.
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ESTABLISHED 1850 'PHONE MAIN 429

BLANCO & BRUN
PROPRIETORS

Poodle Dog Restaurant

CORNER EDDY AND MASON STS.
SAN FRANCISCO, CAL.

HENRY LUND & CO.

Importers
Shipping and Commission Merchants

AGENTS FOR
RELIANCE MARINE INS. CO., Ltd. OF LIVERPOOL
ROYAL SWEDISH AND NORWEGIAN CONSULATE

214 CALIFORNIA STREET
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Represented by
W. C. KIRSCHSTEIN, No. 28 Chapel Street, Liverpool

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Wm. E. PALMER Secretary

GOLDEN STATE AND MINERS' IRON WORKS

BUILDERS of Mining, Milling and Dredging Machinery; Harding Gas, Gasoline and Coal Oil Engines; Machinery of Every Description

231 TO 251 FIRST STREET
SAN FRANCISCO, CAL.

LOUIS DEROME, Manager TELEPHONE MAIN 1271

GLOBE BRASS and BELL FOUNDRY

Manufacturers of

BRONZE STATUARY, CEMETERY WORK AND ART WORK OF EVERY DESCRIPTION

ALUMINUM, MANGANESE AND PHOSPHOR BRONZE, COPPER, GUN METAL, BRASS, COMPOSITION, ZINC AND BABBITT METAL.

CASTINGS

126-128 Main Street San Francisco, Cal.

Palace Hotel Cigar Stand

L. SISENVINE

Importer of
Havana Cigars, Cigarettes
Etc., Choicest Brands

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T. P. KELLY & CO.

544 WEST 22nd ST., NEW YORK

Ceylon Plumbago
Graphite, Black Lead
Foundry Facings and
Blackings

SEA COAL

Our Sea Coal Facings are ground from the most carefully selected and purest deposits of Australian Coal

Agent for the Pacific Coast

S. R. CHURCH,

307 Sansome Street
San Francisco, Cal.

UNITED STATES BATTLESHIP "OREGON"

BUILT BY THE UNION IRON WORKS, SAN FRANCISCO, CAL.

H. T. SCOTT, President and Treasurer
IRVING M. SCOTT, Vice-President and General Manager
J. O'B. GUNN, Secretary
G. W. DICKIE, Manager
ROBERT FORSYTH Engineering Chief
WILLIS G. DODD, Mining Engineer

UNION IRON WORKS

MINING
MILLING AND SMELTING
MACHINERY

ELECTRICAL MACHINERY OF EVERY DESCRIPTION

Steamship Builders

DRY DOCK

OFFICE, 222 MARKET ST.
WORKS AT POTRERO

SAN FRANCISCO, CALIFORNIA

THE U. S. BATTLESHIP "OREGON"

Steamed 4,726 miles without stopping for coal.

Steamed 2,844 knots at the uniform rate of 13 knots an hour.

Weathered Cape Horn in the biggest gale the officers of the ship ever experienced.

Distance covered from Puget Sound to Sand Key, Florida, 18,102 statute miles.

Left Puget Sound March 6, 1898, and arrived at Sand Key, Florida, May 26, 1898, or covering the above distance of 18,102 miles in 59 days.

NAVY DEPARTMENT,
WASHINGTON, July 21, 1898.

MR. HENRY T. SCOTT,
President of the Union Iron Works,
San Francisco, Calif

SIR:

It becomes my pleasant duty to extend to the shipbuilding firm of which you are President, the congratulations of the Navy Department upon the admirable qualities which have been displayed by the United States Battleship "*Oregon*". Without going into details, with which, it may he safely assumed, you are as well acquainted as the Department, it is sufficient to say that the performance of this vessel in making, under circumstances of grave exigence, the voyage from San Francisco, California, to Key West, Florida, without delay or accident of any kind, is of itself highly creditable to her builders; but the fact that after having successfully accomplished such a voyage the vessel was found to be ready at once, without repairs or attention, to enter into the activities of an important naval campaign, renders her achievement most memorable, as one which challenges the admiration of naval experts throughout the world and becomes a subject of especial gratitude and pride on the part of our own people. The "*Oregon*" is, in all of her complicated parts, of American design, materials and workmanship, and she has shown herself to possess the highest qualities sought to be attained in a great battleship—a wide practical radius of efficient action and splendid fighting capabilities. Since these results are not achieved by accident, but reveal high technical ability as well as thoroughness and honest fidelity in the countless details of construction, I have considered it proper to address to you this expression of the appreciation of the Department of the manner in which you fulfilled your contract in building the United States Battleship "*Oregon*"

Very respectfully,
(Signed) JOHN D. LONG,
Secretary.

...THE FOUNDRY...

COSTS ONE ($) DOLLAR
..A YEAR..
WORTH TEN

IT COULD NOT
..BE CHEAPER..

IN THESE DAYS OF COMPETITION, ONLY THE INTELLIGENT, WELL-INFORMED FOUNDRYMAN CAN SUCCEED

KEEP POSTED BY READING *THE FOUNDRY*

SILVER CERTIFICATES, CURRENCY, POSTAL NOTES, CHECKS, N. Y. DRAFTS OR POSTAGE STAMPS GO!

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WORTH TEN

Here's our story--
boiled down:

It is the only Foundry Paper in the World.

It goes to more Foundries and has more Foundry readers than all others combined.

It contains regularly a large amount of original matter concerning the Foundry Business and nothing else.

All the best writers contribute to it.

No man interested in the Foundry Business can read it for a year without getting hundreds of dollars worth of information.

It is nicely printed on good paper and the illustrations are the best.

No pains or expense are spared to make it one of the handsomest and best trade journals on earth.

Its advertising pages alone are of great value to the foundryman who desires to keep himself up to date.

Subscribe now; you will be pleased with it, and look eagerly for its coming each month.

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DETROIT, MICHIGAN, U. S. A.

English Pig Iron

IN BOND OR
DUTY PAID

No. 1 BARROW
No. 1 THORNCLIFFE
No. 3 CARGO FLEET
WHITE CLAY LANE

⚜⚜⚜

Scotch Pig Iron

IN BOND OR DUTY PAID

No. 1 SHOTTS
No. 1 CARRON
No. 1 GARTSHERRIE
No. 1 GLENGARNOCK

FOUNDRY COKE IN CARLOAD LOTS

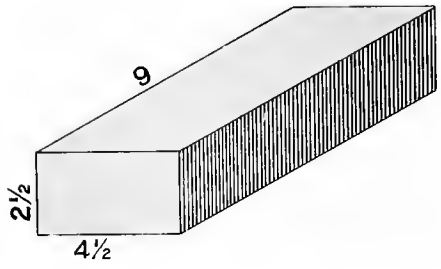
⚜ ⚜ ⚜

ROGERS, BROWN & CO.

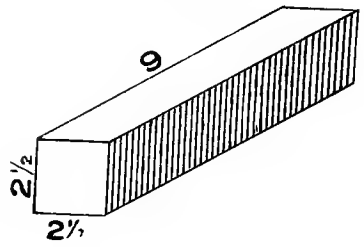
Have stored in San Francisco a greater variety of Pig Irons
than can be found in any other city
in the world.

ENGLISH FIRE BRICK

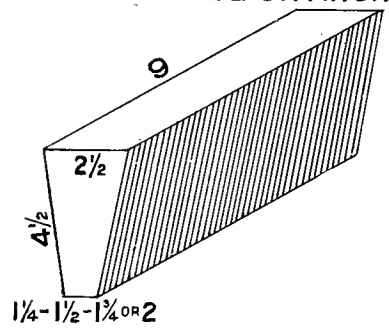
SQUARE OR COMMON SIZE



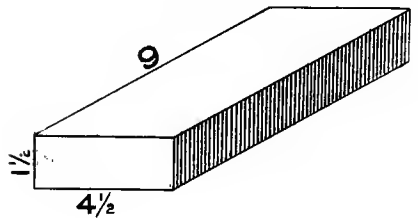
CLOSER OR SOAP OR CROWN



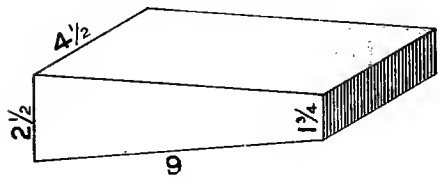
SIDE WEDGE OR ARCH



SPLIT



END WEDGE



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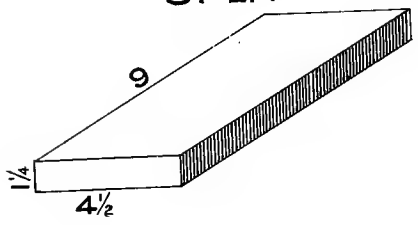
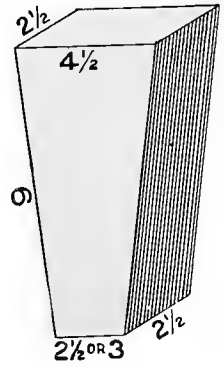


KEY OR BULL HEAD



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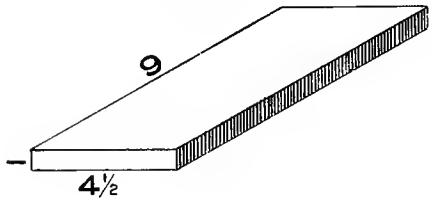
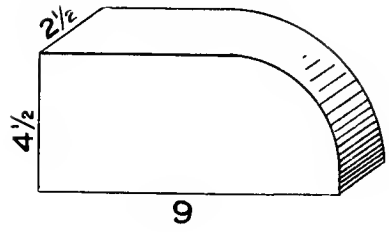


Fresh Snowballs Always on hand—The kind that do not melt

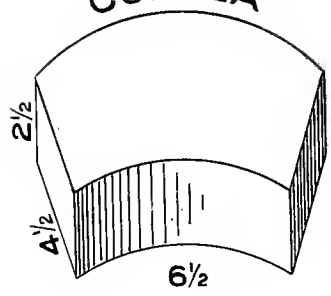
S. R. CHURCH, 307 SANSOME ST., S. F.

ENGLISH FIRE BRICK

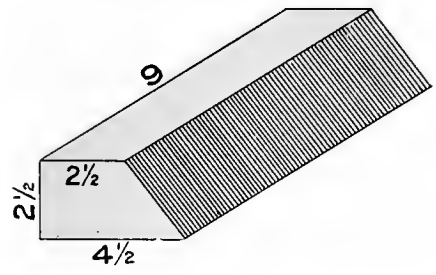
JAMB OR
ROUND END



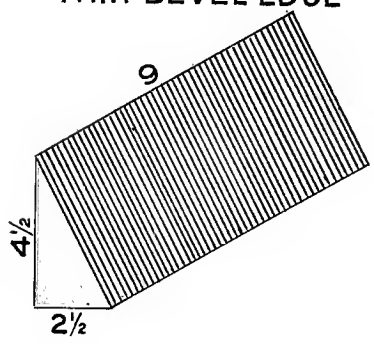
CUPOLA



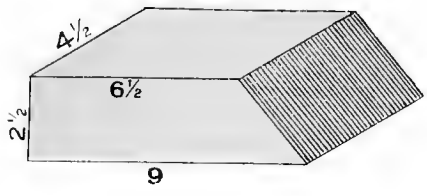
THICK BEVEL EDGE



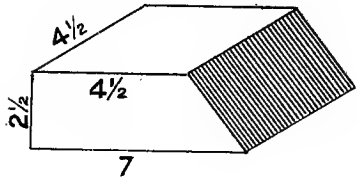
THIN BEVEL EDGE



9 IN. BEVEL END



7 IN. BEVEL END



Uses of Fire Bricks of Different Patterns

Side Wedges or **Side Arches** are used for small arches 4½ inches thick.
End Wedges or **End Arches** are for large arches 9 inches thick.
Bull Heads are used for lining circular furnaces, and are laid horizontally.
Splits and **Closers** are used for making joints, and save labor in cutting squares
Bevel Sides and **Bevel Ends** are for spring arches.
Cupola Bricks are used for lining cupola furnaces.
Tiles are used for large bake ovens, covering flues, etc., in connection with cement works or boiler seating.

Fresh Snowballs **Always on hand—The kind that do not melt**

S. R. CHURCH, 307 SANSOME ST., S. F.

ENGLISH FIRE CLAY

S. R. CHURCH, 307 SANSOME STREET, SAN FRANCISCO,

—— AGENT FOR ——

T. CARR FIRE CLAY

Genuine English Fire Brick Dust

It requires from 500 to 700 pounds of ground Fire Clay to lay 1000 Bricks.
Fire Brick Dust is generally mixed with Fire Clay in laying Bricks.

We have always on hand the following well-known

FIRE BRICKS:

COWEN, MADE IN ENGLAND

T. CARR, MADE IN ENGLAND

M. T., MADE IN ENGLAND

SNOWBALL, MADE IN ENGLAND

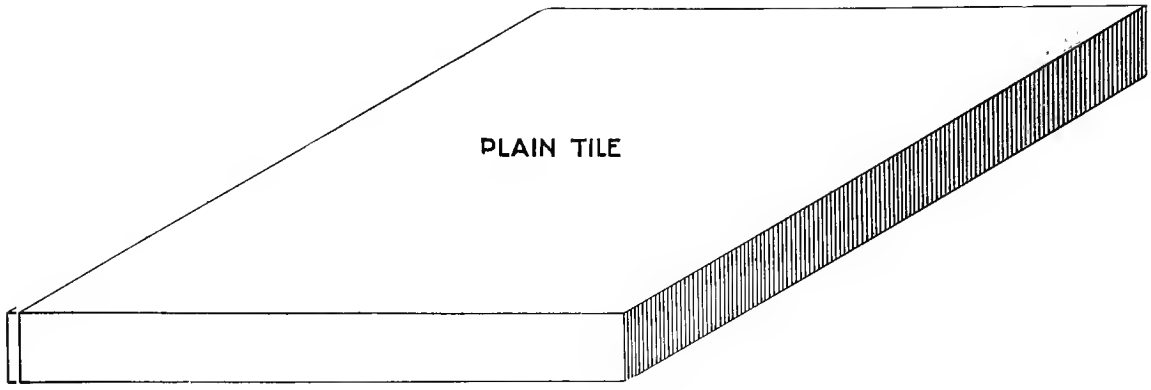
BROWN PAISLEY, MADE IN SCOTLAND

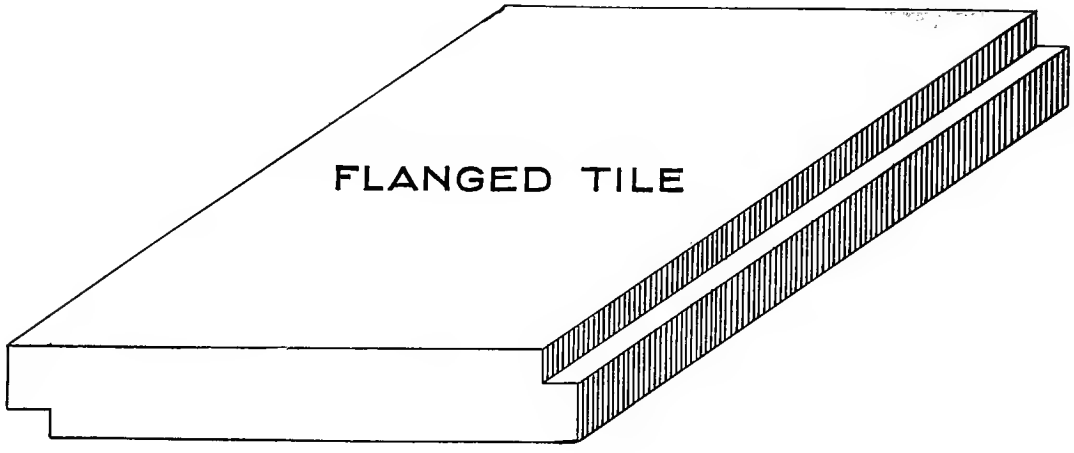
It is a well-known fact that English and Scotch Fire Bricks will last longer and stand more heat than any other Fire Bricks made.

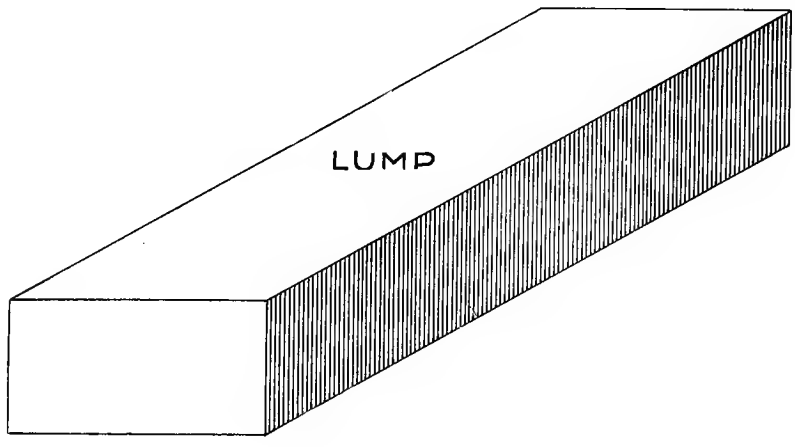
JERSEY FIRE CLAY

FRESH SNOWBALLS Always on hand—The kind that do not melt

ENGLISH FIRE TILES







Fresh Snowballs Always on hand—The kind that do not melt

S. R. CHURCH, 307 SANSOME ST., S. F.

English Fire Tiles

S. R. CHURCH, 307 SANSOME ST., S. F.

Agent for the Pacific Coast for
the famous World-Renowned....

T. Carr Fire Tiles

The following are the sizes which we carry in stock:

PLAIN

8	inches	x	8	inches	x	2	inches				
10	"	x	10	"	x	2	"	24	inches	x 12	inches x 2 inches
12	"	x	6	"	x	2	"	24	"	x 14	" x 2 "
12	"	x	12	"	x	2	"	28	"	x 14	" x 2 "
12	"	x	20	"	x	2	"	28	"	x 12	" x 2 "
14	"	x	6	"	x	2	"	20	"	x 15	" x 3 "
14	"	x	14	"	x	2	"	24	"	x 12	" x 3 "
15	"	x	15	"	x	2	"	24	"	x 14	" x 3 "
16	"	x	6	"	x	2	"	24	"	x 15	" x 3 "
16	"	x	16	"	x	2	"	28	"	x 12	" x 3 "
18	"	x	6	"	x	2	"	30	"	x 15	" x 3 "
18	"	x	18	"	x	2	"	32	"	x 15	" x 3 "
20	"	x	12	"	x	2	"	36	"	x 15	" x 3 "
								36	"	x 20	" x 3 "

FLANGED

20	inches	x	12	inches	x	3	inches
24	"	x	12	"	x	3	"
24	"	x	15	"	x	3	"
28	"	x	12	"	x	3	"
28	"	x	15	"	x	3	"
30	"	x	15	"	x	3	"
36	"	x	15	"	x	3	"
20	"	x	15	"	x	4	"

LUMPS or BLOCKS

20	inches	x	6	inches	x	6	inches
18	"	x	6	"	x	5	"
15	"	x	6	"	x	5	"

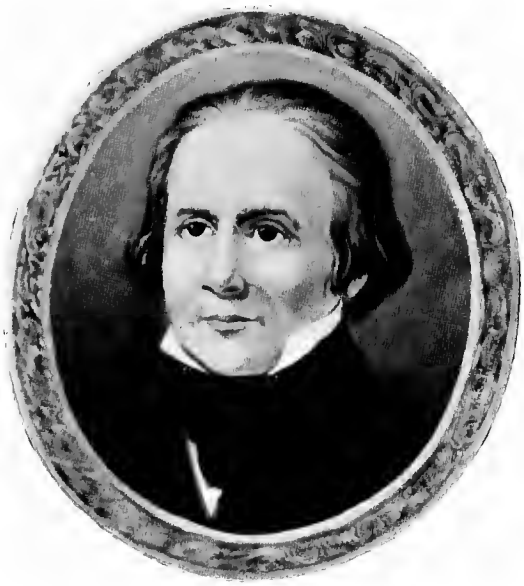
Any sizes of Tiles not mentioned in the above list can be made to order.

Fresh Snowballs Always on hand—The kind that do not melt

ROGERS, BROWN & COMPANY, Pig Iron and Coke

S. R. CHURCH, Agent • • • • *307 Sansome Street* • • • • *San Francisco, Cal.*

HENRY CLAY PIG IRON



HENRY CLAY

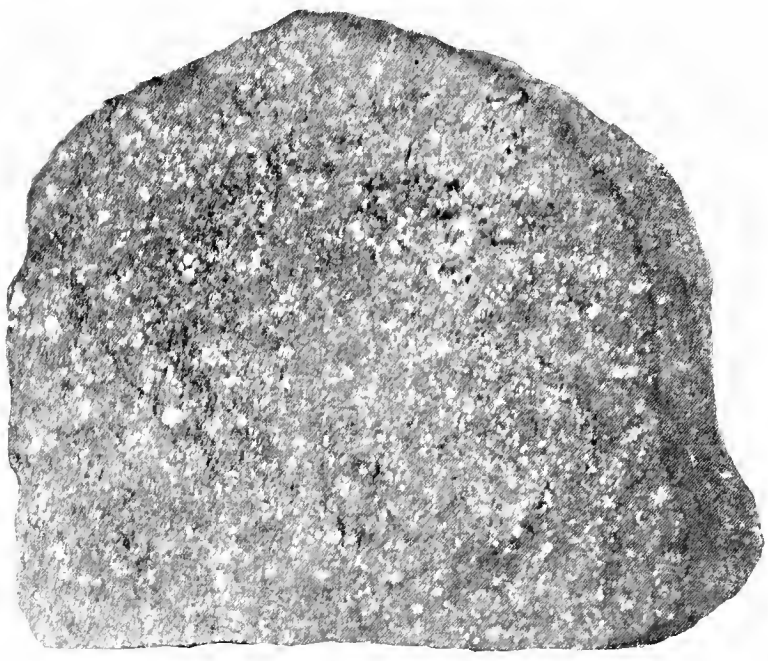
HENRY CLAY PIG IRON

carries scrap in large proportions; makes the melted iron very fluid; reduces shrinkage to a minimum

TRY IT AND BE CONVINCED

ROGERS, BROWN & COMPANY

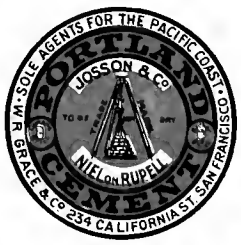
have stored in San Francisco Pig Iron for castings of every description, comprising American Charcoal, Anthracite and Coke Pig Iron, Bessemer, Basic, Malleable, Carwheel, Special and Ordinary Foundry and Mill.



PIG IRON

FOREIGN PIG IRON IN BOND OR DUTY PAID

Also leading brands of Pennsylvania, Virginia, West Virginia, Kentucky and Alabama Foundry and Furnace COKE



NEW YORK LONDON LIMA CALLAO VALPARAISO SANTIAGO CONCEPCION

W. R. GRACE & CO.

234 California Street San Francisco

IMPORTERS

OF PORTLAND CEMENT

LEADING BRANDS

"JOSSON" "HACCOURT" "FEDERAL"

AND

GERMAN SYNDICATE COKE

Up-to-date Equipment is Necessary for Up-to-date Printing We are Up-to-date

We Publish Books for Authors. Our Experience Saves You Time and Trouble

The Hicks-Judd Company

Printers

Publishers

Bookbinders

23 First Street San Francisco California

The Printing and Stationery of a house betrays its Character and Taste

Why employ Cheap and Inferior Agencies when Cheap and Superior can be had at about the same price?

Exporters of
WHEAT, BARLEY, RYE, ETC.
CANNED SALMON AND FRUITS

Importers of
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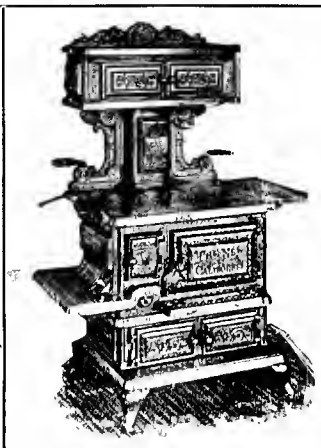

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